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ARCHIVES OF OTOLARYNGOLOGY

VOLUME 11 APRIL, 1930 NUMBER 4

# DISEASES OF THE ESOPHAGUS

## ANGIONEUROTIC EDEMA, URTICARIA, SERUM DISEASE AND HERPES *

CHEVALIER JACKSON, M.D.
PHILADELPHIA

When one speaks of urticaria, angioneurotic edema and herpes, all physicians at once recognize clinical entities and know whereof one speaks. When, however, one attempts to define these diseases, to classify and to analyze them, and especially to state the etiology and the pathologic mechanism by which the well known lesions are produced, one enters the field of the indefinite if not the unknown. Whether any or all of the four diseases included in the title are to be classified as a neurosis or a neuronosis, it is neither my intention nor my province to discuss beyond recalling the fact that herpes zoster has been definitely classed as a neuronosis. No one is qualified to predict that herpes simplex, urticaria and angioneurotic edema will or will not follow zoster into the same classification. Therefore, until the various problems are solved one must continue to record clinical facts, leaving to the future the difficult task of creating or adjusting theories and laboratory data to fit these facts. The names and the classification of the diseases may be rearranged in the light of future knowledge, but carefully made clinical observations recorded accurately and separated from inferences will always remain clinical facts. It is with the just mentioned thoughts in mind that the following cases are reported.

## REPORT OF CASES

### ANGIONEUROTIC EDEMA OF THE ESOPHAGUS

CASE 1.—A woman, aged 38, was sent to the bronchoscopic clinic by Dr. Jacob Wolf because of difficulty and pain in swallowing and retrosternal pain extending through to the back. These symptoms had come on suddenly, on the day before admission. Four days before admission, the patient had been seized with violent abdominal pain, tenesmus, white, painless swelling of the right hand, and swelling of the upper lip, the lower lid of the right eye and the tip of the tongue. These symptoms were slightly less, but none had disappeared when the patient was admitted. The swelling of the eyelid afterward increased, and a bleb formed on it and broke. Within a few hours the patient became unable to swallow solids. Liquids were swallowed slowly, and the process was accompanied by a sense of constriction, a "boring sensation" and pain. The previous medical history did not include any esophageal symptoms, but there had been a swelling of the palate and

* Submitted for publication, April, 1929.

tongue a number of times, and there was a history of numerous painful gastrointestinal attacks. During one of these attacks, an exploratory laparotomy had given negative results. During two attacks, there had been painful micturition.

*Examination.*—Roentgen examination by Dr. George C. Johnston showed the thoracic esophagus to be closed to a small lumen, through which the opaque mixture trickled slowly. The border of the shadow at the constriction was smooth.

Esophagoscopic examination showed the mucosa of the hypopharynx to be normal. In the midthoracic portion the lumen was almost completely occluded by firm, swollen, bleeding nodules springing from the right wall of the esophagus. The central portion of each nodule was white, but at the base of each nodule there was a zone of intense hyperemia. The blood seemed to be coming from the narrow creases between the nodules.

*Progress.*—Plenty of water and liquid foods were given, including strained vegetable soups and fruit juices. The ability to swallow gradually improved, until at the end of two weeks it seemed to be normal and free from discomfort. By this time all of the other symptoms had subsided.

A second roentgen examination was made by Dr. George C. Johnston, and the results were negative. The esophagus seemed to be perfectly normal as to lumen and function.

At a second esophagoscopy, the lumen and mucosa seemed perfectly normal. The esophagoscope passed on into the stomach without encountering any obstruction.

*Comment.*—The esophagoscopic appearances of the lesion were unlike those of any of the lesions commonly encountered. Considering their transient character and the accompanying lesions of angioneurotic edema, the diagnosis of angioneurotic edema of the esophagus seems fully justified.

### URTICARIA OF THE ESOPHAGUS

Case 2.—A woman, aged 43, was sent to the bronchoscopic clinic by Dr. William B. Ewing because of inability to swallow anything, even water. Saliva was regurgitated at intervals. Difficulty in getting down solids had appeared suddenly at the same time as an eruption of intensely itchy white wheals, covering both sides of the front of the chest, the back and the left side of the face. The facial eruption extended over the left side of the upper and the lower lip and the inside of the left cheek, the mucosa of which was indurated and white. The region of the left parotid gland was swollen and tender. Dr. Ewing declared the dermal eruption to be a typical urticaria. He had treated the patient for previous attacks, none of which had involved the mucosa. A number of asthmatic attacks had seemed to alternate with the urticarial eruptions. Welts and wheals could be produced by scratching the back.

*Examination.*—The family history and the results of general physical examinations were negative. Sensitization tests had not been made; the Bordet-Wassermann reaction was negative.

Roentgen examination by Dr. George C. Johnston showed complete stoppage of the esophagus about 6 cm. above the diaphragm.

Esophagoscopy, without general or local anesthesia, revealed a normal lumen and mucosa down to about the junction of the middle with the lower third. At this point the esophagus was completely closed by a firm, white, nodular swelling of the walls. Reexamination with an esophagoscope of small lumen (5 mm.) revealed no safely permeable lumen. At this reexamination, which was made

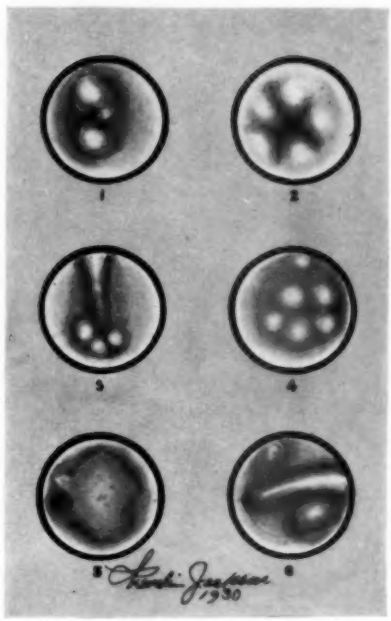

Fig. 1 (case 1).—Angioneurotic nodules occluding the lumen of the midthoracic esophagus of a woman, aged 38 years. A little blood lay in the creases between the folds.

Fig. 2.—The same patient as in figure 1, two weeks later. The hard nodules have disappeared, the lumen has reappeared and the soft, velvety folds are normal. The transient character of the lesion illustrated in figure 1 confirmed the diagnosis.

Fig. 3 (case 2).—Urticaria of the esophagus in a woman, aged 43 years. The lumen is closed by white, nodular swelling of the walls. The longitudinal streak appeared after insertion and withdrawal of the esophagoscope; it evidently resembled the urticarial dermal ridges that could be produced at will by drawing the finger across the skin. Esophagoscopic examination of this patient one week later showed the esophagus to be normal at this point as well as throughout its entire extent.

Fig. 4 (case 3).—The lumen of the thoracic esophagus at this point, about the level of the crossing of the left bronchus, was completely occluded with firm, nodular swellings that seemed integral with the esophageal wall. There was no bleeding, erosion or ulceration. About ten days later, reexamination showed the esophagus to be normal; the esophagoscope went through into the stomach without meeting any obstruction.

Fig. 5 (case 4).—Superficial ulcer of the lower end of the esophagus in a patient with chronic esophagitis. The ulcer was probably secondary to ruptured herpetic vesicles.

Fig. 6.—The same patient as the one in figure 5. Two vesicles filled with yellowish fluid are seen, one on each side of a long, weltlike ridge. At a subsequent esophagoscopy, the vesicles were seen to have ruptured; their sites were occupied by a flat, grayish exudate. The streak had flattened and was bleeding slightly. At an esophagoscopy a few weeks later the esophagus was found to be normal.

only a few minutes after the first examination, there was noted an intensely reddened mucosa with a white ridge extending down the anterior wall for a distance of about 7 cm., and ending in the white nodular masses.

*Progress.*—The patient was given large quantities of water by bowel. A continuous small flow was substituted after free evacuation of the colon was obtained. No attempts at alimentation or internal medication were made. On the fourth day the rash had almost disappeared. The patient reported that she could swallow water without difficulty.

Reexamination with the esophagoscope about a week after the first esophagoscopy showed the esophagus to be normal as to both lumen and mucosa.

A second roentgen examination with an opaque mixture by Dr. George C. Johnston revealed no abnormality in the esophagus.

*Comment.*—The appearance of the esophageal lesion, the local reaction to the passage of the esophagoscope, the complete disappearance of the esophageal lesion and the coincident dermal and buccal urticaria, all seem to justify a diagnosis of urticaria of the esophagus. The chief distinction between the manifestations in this case and the lesions of angioneurotic edema lies in the production of lesions on the skin by scratching and in the esophagus by passage of the tube. The skin eruption was not of the so-called "giant" form.

### SERUM DISEASE OF THE ESOPHAGUS

CASE 3.—A boy, aged 18, was referred to the bronchoscopic clinic by Dr. A. B. Booth because of complete obstruction of the esophagus following four days after the injection of a prophylactic dose of diphtheritic antitoxin. The boy had a typical urticaria over the front of the chest and both sides of the face. The tongue was enormously swollen; saliva was drooling from the mouth. There was no difficulty in breathing. Glands in the neck and axilla were swollen and tender. There was slight fever (from 99 to 101 F.), and moderate aching pains were present in the muscles and joints of the legs and arms.

*Examination.*—Results of general physical examination by Dr. Booth were negative.

Roentgen examination by Dr. Russel H. Boggs showed complete closure of the esophagus at the level of the top of the aortic arch. The aorta, however, apparently was normal.

Examination of the larynx with the mirror was interfered with by the enormously swollen tongue. The esophagoscope, however, readily exposed the larynx, which was seen to be normal. The hypopharynx was normal. A few centimeters below the beginning of the thoracic esophagus the lumen was completely closed by extremely firm, white, nodular masses that seemed integral with the esophageal wall. There was no bleeding, erosion or ulceration.

*Progress.*—An abundance of water was given by bowel without attempt at alimentation. At the end of five days all symptoms were gone, except that the lymph nodes were still palpable. The ability to swallow returned.

A second esophagoscopy ten days after the first revealed a normal esophagus; the esophagoscope passed on through into the stomach without encountering any obstruction.

*Comment.*—The lesion in the esophagus, in view of its appearance, its transitory character and its association with the dermal manifestations, was urticarial. Its association with the symptoms of serum disease is noteworthy.

### HERPES OF THE ESOPHAGUS

CASE 4.—A woman, aged 52, complained of an almost constant feeling of pressure, discomfort and burning referred to the midthoracic region. At times there was pain also, and it extended through to the back. Difficulty in swallowing solids and sometimes liquids, especially hot liquids, had been intermittent, but the attacks were of gradually increased severity since the first one three and a half years before. At that time the patient was under mental stress because of her husband's illness. Since that time she had been free from symptoms between attacks but the intervals were getting shorter. A number of times the diagnosis of "cardiospasm" had been made, and dilatations had been given without benefit. At times the dilatations were extremely painful.

*Examination.*—Roentgen examination by Dr. Willis F. Manges revealed a normal outline of the esophagus when filled with barium mixture. It was noted that there was roentgen evidence of well advanced spondylitis of the dorsal spine.

Esophagoscopy showed a chronic esophagitis, especially at the lower third of the thoracic portion; the walls were coated with thick tenacious secretion. In the midst of this chronic inflammatory area there was a superficial ulcer about 12 mm. in diameter, covered with a slightly yellowish exudate. Surrounding the ulcer was a bright red zone, showing no infiltration. The hiatal pinchcock was abnormally patulous. A tentative diagnosis of peptic ulcer was made. A 5 per cent solution of silver nitrate was applied to the ulcer through the esophagoscope.

*Progress.*—General medical management under the care of Dr. Henry K. Mohler greatly improved the patient's general condition. Bismuth subnitrate was given, dry on the tongue, for its local effect. Two subsequent esophagoscopies showed the ulcer to be healing rapidly; at the end of two weeks, it was completely healed. The subjective symptoms referable to the esophagus totally disappeared. The patient could eat freely of all foods in a normal and satisfactory way. At a third esophagoscopy the esophagus was found to be normal except for a chronic esophagitis of mild degree in the lower third.

About a week later the patient complained of a burning sensation back of the midsternal region on swallowing. The food seemed to pass a sensitive spot, and the burning lasted for an hour or two. Occasional pains were felt in the same region, and at times they extended through to the back. Frequent and painful micturition was complained of.

A fourth esophagoscopy revealed a ridgelike elevation of inflammatory mucosa in the lower third of the thoracic esophagus; the base of the ridge on each side was red; the summit of the ridge throughout its length of about 6 cm. was occupied by a grayish-white adherent exudate. The weltlike ridge was not on the site of the former ulcer. Two blebs were seen, one on the anterior and one on the right wall.

A fifth esophagoscopy showed the site of the weltlike ridge to be a flat eroded and bleeding streak. The sites of the blisters were flat and covered with gray exudate.

At the twelfth esophagoscopy, the esophagus was found to be normal.

After the patient returned home her physician reported that she had remained well for about a month. She was then taken suddenly with difficulty in swallowing

and a feeling of fulness back of the manubrium. This was followed by severe pain in the right leg, which a few days later was covered with a herpetic eruption.

*Comment.*—The eroded, weltlike ridge in the esophagus, appearing suddenly in an esophagus known to have been free from it a few days before, and its disappearance a week later, implies an evanescent lesion. The ulcer that was present when the patient was first examined healed under treatment. It was probably a chronic lesion following an acute lesion. The acute primary lesion was probably herpetic. No lesion other than herpes or angioneurotic edema would be so evanescent as the esophagoscopically observed acute lesions were seen to be. The herpes zoster and the esophageal lesions may both have been related to the spondylitis, though this seems unlikely.

## CONCLUSIONS

1. Angioneurotic edema, urticaria, serum disease and herpes may involve the esophageal mucosa.

2. Herpes is distinguished by blisters or blebs that soon break, leaving a raw, eroded surface, which is later covered with exudate.

3. Angioneurotic edema, urticaria and serum disease of the esophagus are associated with other similar manifestations.

4. Their affinities may preclude differential diagnosis as among them, and they may be essentially the same; however, there is no difficulty in distinguishing them from other lesions of the esophagus, provided the esophagoscope is used.

5. The esophagoscope is the only means by which the diagnosis can be made with certainty.

6. The day has arrived when it may be said that it is unjustifiable to treat a patient for conditions in the esophagus without looking into the esophagus.

## DISCUSSION

DR. HARRIS P. MOSHER, Boston: I have always felt that one would find some anaphylactic phenomena back of the series of cases which Dr. Jackson presented. I am much surprised that anaphylactic tests were not made in these cases.

I would like to ask about the x-ray picture in the last case of ulcer of the esophagus. Does that show the type of cardiospasm that one would find in peptic ulcer?

DR. HENRY H. FORBES, New York: About six or seven years ago I had an experience which I think will be of interest. It was a most remarkable case of chronic pemphigus which lasted some years. The patient, a man, came to the Post Graduate Hospital with a history typical of that in Dr. Jackson's first case: He had been unable to swallow for thirty-six hours. The x-ray picture showed the same obstruction, and on examination of the esophagus the instrument could be passed down only a certain distance. Knowing the possible anaphylactic conditions existing, as Dr. Mosher said, one of the house physicians suggested the use of epinephrine. The patient was given 12 minims of the epinephrine hydrochloride, and within about fifteen minutes he could swallow as well as any one and

although a second esophageal examination had not been made, a second x-ray picture showed that the column of bismuth went down in a perfect line.

SIR ST. CLAIR THOMSON: Some of these vague manifestations have been known to me for many years, and in England the title of "Quincke's edema" is used. I would suggest that it is rather useful to use a comprehensive term like that for these various manifestations until one is able to differentiate them from one another. Just as the term "septic sore throat" is used to cover acute edema of the larynx and pharynx and a number of the diseases which have similar symptoms, so here the term "Quincke's edema" is still used. I have seen these transitory edemas not only on the face and the eyelids, on the lips and inside of the cheek and the tongue, but also in the larynx. I have seen them appear and disappear, and I have never seen serious results. I generally treat them with arsenic and patience.

The question of the relationship of herpes to pemphigus is interesting. I have watched a few cases of herpes located chiefly in the fauces and in the larynx. In all the cases of pemphigus that I have seen (only about three or four) the patients have died; the condition has not appeared and disappeared although the lesions have improved. In pemphigus of the larynx the symptoms never disappear entirely, and it has taken sometimes two, and never longer than three years, to prove fatal. Perhaps my experience is limited, but still I fancy that in England there are perhaps as many patients with that type of disease as there are in this country. Perhaps I am rather an unsympathetic person, but I believe that these cases may be classified as the neurotic, the erotic and the tommyrotic.

DR. SIDNEY YANKAUER: The only cases of this kind that I can recall seeing, I saw during the stage when the esophagus was normal.

DR. CHEVALIER JACKSON: Replying to Dr. Mosher, four different roentgenologists in four different cities had made a diagnosis of cardiospasm. Dr. Manges recognized the presence of an anatomic narrowing which did not, for the time being, disappear and did not shift its location. After the lesions had healed, the esophageal wall was apparently in its normal place, and the lumen was normal. I omitted a number of details in regard to the last patient. She had herpes in a number of places on the body, of apparently the type of herpes febrilis. Under treatment by Dr. Mohler, which included rest in bed and cutting down the cigarets from about 150 a day to five or six, and the elimination of various other things that a neurotic person should not indulge in, she was apparently brought back to normal. She was sent home and her physician reported that she was well for a few weeks; then she developed a herpes zoster of the leg, which has had a prolonged and extremely painful course, followed by postherpetic pains such as those patients often have. In the pre-esophagoscopic days this condition would have been called cardiospasm. I think the suggestion of Sir St. Clair Thomson that these diseases all be classed together, until more is known about them, is excellent. That is why I have grouped them in this paper.

# EYE, EAR, NOSE AND THROAT COMPLICATIONS OCCURRING IN PATIENTS IN A HOSPITAL FOR THE TUBERCULOUS*

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OTEEN, N. C.

The Veterans' Hospital at Oteen, six miles from Asheville, N. C., during the last three years has had an average patient population of about 700. About 99 per cent of the patients are tuberculous, a large percentage of whom are confined to their beds. At the time this paper was written, a census showed the hospital to have 563 patients: twenty-two have temperatures above 100 F; ten are classified as critically ill, and eighteen are listed as seriously ill, but as a matter of fact any patient with pulmonary tuberculosis has a serious illness. Of the 563 patients, all but 96 receive their food on trays, and 200 of them have to be bathed in bed.

In addition to these, a varying number of outpatients come to the hospital, many of whom are nontuberculous, but it is a conservative estimate to say that 95 per cent of the work is for the tuberculous patient. In these patients, diseases of the eye, ear, nose and throat are rarely considered a major disability. The treatment, then, must be modified and often omitted. However badly one's dwelling may need repairs, one does not undertake them if the house is on fire. Many of the patients arrive on litters in the last stages of pulmonary tuberculosis, with only a few weeks, or sometimes a few days, to live. In the absence of symptoms, any routine examination of the eye, ear, nose and throat is contraindicated. Of what use is it to determine the patient's color perception or his visual acuity, or to record the fact that he has a deviated septum and chronic tonsillitis? The first duty is to care for a human being—not to conduct research work. It might be said that all these patients should at least be examined for laryngeal tuberculosis. In this I do not agree. When these patients have symptoms of diseases of the throat it will be time enough for intervention. I am speaking now, of course, of the patients with far advanced, hopeless cases, on whom the useless burden of needless examination should not be laid.

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* From the United States Veterans' Hospital, Oteen, N. C.

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* Read before the Section on Laryngology, Otology and Rhinology at the Eightieth Annual Session of the American Medical Association, Portland, Ore., July 10, 1929.

While I have stated some of the difficulties encountered in dealing with tuberculous patients, let it not be understood that but little can be done for these unfortunates. Especially in cases in which the larynx is involved, the method of treatment often means either life or death. For many other patients who sooner or later must succumb much can be done to relieve suffering and to add to the patient's comfort and morale.

### RETINAL HEMORRHAGE AND IRITIS

An unusual tendency to retinal hemorrhages has been noted among these patients. Under appropriate treatment, the vision usually returns to normal in a short time, but recurrences are frequent.

On March 26, 1926, I was called to see a patient who was confined to his bed and who stated that the night before he had suddenly lost nearly all vision in the right eye. He could count fingers only. The fundus could not be seen. He was given atropine and was told to rest. By April 9, vision had increased to 5/200, and on April 16, it was 20/200. On April 23, ethylmorphine hydrochloride, U. S. P., was substituted for the atropine and by May 21 vision had increased 20/40. On September 2, there was recurrence of the hemorrhage. He improved somewhat, but on September 13, there was another hemorrhage and another on November 15. In December, he had several slight hemorrhages. On April 29, 1927, vision was back to 20/30, and reexamination one month later gave the same results. The patient stated that the vision in this eye was 20/30 at the time he entered the army. He was discharged from the hospital soon after the last examination and has disappeared from observation.

Another condition of the eye that has been noted frequently is the tendency to recurrent attacks of iritis. These are usually mild, and the patients readily recover after a few instillations of atropine. In a few months, there is usually a recurrence. A case has never been seen which was considered a true tuberculous iritis.

### TUBERCULOSIS OF THE EYE

There have been three patients in whom a diagnosis of tuberculosis of the eye has been made.

Case 1.—A negro, aged 30, on admission to the hospital showed vision in the right eye reduced to form perception only. He stated that it had been getting worse for seven years. Tension was reduced; the eye was tender, and a large leukoma made examination of the deeper structures impossible. Some one had made a diagnosis of syphilis of the eye, and for this reason he was unable to secure compensation. No other evidence of syphilis could be found. The Wassermann reaction was persistently negative. Enucleation was advised for two reasons: first, the eye was useless, disfiguring and at times painful; second, it was necessary to clear up the diagnosis. Laboratory examination showed no evidence of syphilis in the enucleated eye, but showed the picture to be that of tuberculosis. An examination of an enlarged gland in the neck which was removed showed tuberculosis. The patient made a good recovery, is wearing a well fitted prosthesis, was able to secure compensation and is having no further trouble.

CASE 2.—The patient said that vision had been poor in the left eye for some time. Examination showed a moderate amount of astigmatism in each eye. Vision with correction in the right eye was 20/20 and in the left eye, 20/200. Examination of the fundus showed a diffuse retinitis in the macular region. The patient has been under observation for about three years, and no special changes can be detected in the fundus. The eye, however, is frequently painful unless excluded from the light, and the vision has now dropped to 12/200. This patient has been seriously ill all this time from pulmonary tuberculosis.

CASE 3.—A man, aged 28, complained of constantly recurring headache. He had pulmonary tuberculosis and a negative Wassermann reaction. Under treatment with homatropine, he wore glasses with a plus 1.25 sphere which corrected the vision to 20/20 plus 1. The right eye showed a small area of choroiditis 1 disk diameter below the disk. Four months later, two similar lesions appeared in the left eye a short distance below the macula. The patient's tonsils had been enucleated; the sinuses appeared normal, and the dental service found no suspicious teeth. The diagnosis of tuberculous choroiditis was thus made by exclusion. The patient has been examined from time to time during the last two years, and there seems to be no further extension. He comes back to the clinic every month or so complaining of severe headaches, which are relieved at once by a drop of atropine or homatropine.

### TUBERCULOSIS OF THE NOSE

No cases of tuberculosis of the nose have been seen. When symptoms have been urgent, a few deviated septums have been operated on with satisfactory results.[1]

No sinuses except the maxillary have been operated on, and in these the simplest operation possible has been done—a resection of the naso-antral wall with subsequent irrigations. In several of these cases, the effect on the patient has been little short of marvelous. I shall cite one case.

A patient suffering from pulmonary tuberculosis, who was confined to his bed, was sent to the Eye, Ear, Nose and Throat Department on Nov. 20, 1926, on account of severe headaches. He had some nasal discharge, and the right antrum was found by transillumination to be dull. This was confirmed by roentgen examination. Puncture and lavage showed foul pus. He was referred to the dentist, and one suspicious tooth was extracted. Puncture and lavage were repeated several times at varying intervals, but the condition failed to clear up, and on Feb. 24, 1927, a partial turbinectomy and resection of the naso-antral wall was done. The patient's headaches disappeared; his fever and toxemia were relieved, and he gained 25 pounds (11.3 Kg.). Soon after this he left the hospital without permission and was married. He returned in a few months. He had a slight discharge from the right nostril, but no other symptoms. Examination at this time showed that the pulmonary condition was much improved. In only one patient has the laboratory report showed tubercle bacilli present in the pus obtained from the antrum.

1. Since this paper was written, one patient showing a tuberculous lesion of the left nostril has been admitted.

### NONTUBERCULOUS CONDITIONS OF THE EYE

Several interesting nontuberculous conditions of the eye have been seen.

CASE 1.—A physician, aged 54, suffering from pulmonary tuberculosis, complained of pain in the eyes, photophobia and what he described as a "flickering" first in one eye and then in the other. These attacks would last two or three days, would be relieved by cold applications, but in a short time would recur. He was unable to read, except for a short time, on account of the asthenopia. His vision, with correction, was 20/20 in each eye; tension was normal. There was no lesion of the fundus; the tonsils and sinuses were normal. He was referred to the dental clinic for removal of any foci of infection that might be found, and following the extraction of several teeth the symptoms promptly disappeared.

CASE 2.—A dentist, aged 47, with no tuberculous history, came to the hospital on Dec. 22, 1927, complaining of some blurring of vision in the right eye. He gave a history of having just recovered from an illness of several weeks' duration, which was supposed to have been due to influenza. His vision was 20/50 in the right eye and 20/30 in the left. In the right eye the field was much contracted; in fact, it was almost a gun barrel type of field. The disk was much blurred. There were patches of exudate and a few small hemorrhages in the retina. The tonsils had been enucleated, the sinuses were clear, and there was no evidence of nephritis. Removal of infected dental foci was suggested. All the teeth were extracted, and the condition promptly improved. By Feb. 3, 1928, vision was 20/20 in each eye; there was no contraction of the visual field, and the patient said that he felt better than he had at any time for over a year.

CASE 3.—A woman, aged 32, married, with no tuberculous history, complained of poor vision suddenly occurring in the right eye. Vision was found to be 20/200 in the right eye and 20/20 in the left. The media were not clear, but an area of chorioretinitis could be made out near the macular region. The patient had chronic tonsillitis. The sinuses were normal. The tonsils, although slightly enlarged, did not give the appearance of being a probable factor in the condition of the eye. She was therefore referred to the dental clinic for removal of dental foci. Following the extraction of abscessed teeth, she promptly improved and was discharged in six weeks with normal vision. In addition to the removal of the offending teeth, these two patients were both treated with ethylmorphine hydrochloride in increasing strengths, and rest in bed was insisted on.

An examination of the eye is frequently called for, and rightly so, when tuberculous meningitis is suspected. In this hospital tubercles have occasionally been found in the choroid but never early enough to make them an important factor in the diagnosis. The most constant observation in the fundus is hyperemia of the disk. It is believed, however, that inequality of the pupils, photophobia and diplopia, especially if at first they are of short duration, are much more important symptoms and are more valuable than any shown by an examination of the fundus, because they occur early. The transitory nature of any one of these, if not explained by other causes taken in conjunction with persistent headache in a tuberculous patient, makes the diagnosis of tuberculous meningitis probable.

### LESIONS ON THE TONGUE

In this hospital it is the custom to refer patients showing lesion on the tongue to the eye, ear, nose and throat department. During the last three years, there have been ten cases showing tuberculous ulceration.

CASE 1.—An ulcer of considerable size on the tongue, as well as ulceration in the lower jaw, was present in a patient referred to this department with a request for a biopsy on the tongue. The patient was advised against this procedure, but it was done by another surgeon and the lesion proved tuberculous. Following the biopsy the lesion rapidly spread, and the patient died in six weeks of pulmonary tuberculosis.

CASE 2.—This patient had an ulcer on the tongue of three years' duration. Following four cauterizations at intervals of from two to six weeks, he was transferred to another hospital with the lesion on the tongue much improved.

CASE 3.—This patient showed an ulcer about the center of the tongue of five weeks' duration. It was cauterized four times and was considerably improved at the time of the patient's death from the pulmonary lesion four months later. Postmortem section showed the lesion to be tuberculous.

CASE 4.—A tuberculous ulceration was present far back on the left side of the tongue. It was cauterized on July 13, 1926, and the patient was discharged from the hospital five months later with the ulcer completely healed.

CASE 5.—A man had a large painful ulcer on the under side of the tongue near the tip. The symptoms were entirely relieved after a few cauterizations, and he died ten months later of pulmonary tuberculosis, without recurrence of the ulceration.

CASE 6.—An ulcer of three weeks' duration was present far back on the right side of the tongue. This was cauterized and gave no trouble for one month, when some tenderness was again noted. It was not necessary, however, to recauterize. This lesion remained healed, but a year and a half later the man developed another ulcer about the center of the tongue, which yielded to two cauterizations.

CASE 7.—A patient was transferred from another hospital with an ulceration on the tongue of one year's duration. He had been treated for six months with a quartz lamp without benefit. One cauterization was done, and the ulcer was entirely healed and remained healed up to the time of his death from pulmonary tuberculosis a few months later.

CASE 8.—Two small lesions were present on the upper surface of the anterior portion of the tongue. These were painful and had existed for several months. One cauterization was done. The patient was discharged from the hospital ten days later with the ulcerations entirely healed.

CASE 9.—A patient had ulceration on the right side of the tongue of three months' duration. One cauterization resulted in complete healing. Examination one year later showed no recurrence.

CASE 10.—A patient had a large ulcer on the right side of the tongue. Cauterization was done. This was repeated in two months. Two months later, the patient left the hospital against medical advice with the ulceration entirely healed.

*Comment.*—All of these patients, except the one in case 5, had negative Wassermann reactions. Practically all of them had been treated with nitrate of silver or other medicaments before they were sent to the clinic for cauterization.

Of the nine patients cauterized, complete healing was secured in six; two left the hospital much improved, and one died of the pulmonary lesion before the tongue had entirely healed.

I know of no tuberculous lesion that responds to treatment so well as these ulcerations of the tongue.

My associates and I do not hesitate to perform tonsillectomies on tuberculous patients, but the indications must be definite and clear. A careful laryngeal examination should always precede the operation. We always operate under local anesthesia and frequently remove only one tonsil at a sitting and thus lessen the chance of an unfavorable reaction. From time to time reports appear of patients dying from the local anesthetic used for tonsillectomy. For this reason we never make injections into the second tonsil until the first has been removed and with it, of course, the major portion of the anesthetic used. In this way, we believe we avoid practically all danger from the anesthesia. Only one of the tonsils that we have removed was found to be tuberculous.[2]

### LARYNGEAL TUBERCULOSIS

Laryngeal tuberculosis, as is well known, is a frequent complication of pulmonary tuberculosis. One of the earliest signs is hyperemia of the vocal cords. When this occurs it is necessary to differentiate between tuberculosis, syphilis and irritation from excessive coughing or chronic tonsillitis as a causative factor. The patient should at once be instructed to rest his voice. He should be reexamined from time to time, when the subsequent changes will usually make the diagnosis clear. In the presence of pulmonary tuberculosis and a positive Wassermann reaction the diagnosis, however, may long remain in doubt, unless the patient can be put on active antisyphilitic treatment as a therapeutic test. The usual pathologic changes in laryngeal tuberculosis are general infiltration of the larynx, edema of the arytenoids, proliferations in the posterior commissure or a thickening of the epiglottis or even ulceration. The most frequent site of ulceration is the vocal cords or the epiglottis, although not infrequently it is in the vocal bands or arytenoids. When

2. Since this paper was written, more tonsillectomies have been done in the hospital in far advanced cases and more tonsils with tuberculous lesions have been found. At this writing, 12.5 per cent of the tuberculous patients operated on have shown tuberculosis of the tonsil on laboratory examination. Healing has occurred in these, and if the condition had been known prior to operation it would not have been a contraindication to enucleation.

the diagnosis is made, the treatment should be begun. The two lines of treatment that have been found most efficient are voice rest and electric cauterization, and there are many cases in which it is the part of wisdom to begin the voice rest long before the diagnosis is definitely established. Any patient with pulmonary tuberculosis who has a tendency to hoarseness should rest his voice. If this were more often done, the incidence of laryngeal involvement would be much decreased. The best kind of voice rest is absolute voice rest, the patient using a pad and pencil instead of the vocal cords. Patients who will not do this are urged to substitute a whisper for ordinary speech. Smoking is usually thought to be harmful, but I believe that most addicts can smoke in moderation without harm to the larynx and with some benefit to their morale.

After being told to rest his voice, the patient should be reexamined each month. He should be examined oftener only if the symptoms demand it. Disturbing the patient for frequent examinations or, what is worse, for various topical applications is as much contraindicated as is the too frequent removal of surgical dressings from a healing wound. Under this treatment a fair number of patients with undoubted laryngeal tuberculosis will recover, especially if the pulmonary condition is improving. The course of the laryngeal disease, however, does not by any means always follow that of the pulmonary condition. One of the most malignant cases of laryngeal tuberculosis that I have ever seen occurred in a patient whose pulmonary lesion was not extensive and was thought to be improving. On the other hand, time after time I have seen the laryngeal lesion heal under appropriate treatment and stay healed, while the pulmonary condition goes from bad to worse.

If the monthly examination shows that the patient is not making satisfactory progress, electric cauterization is done under local anesthesia from moistened cocaine flakes applied two or three times to the area involved and preceded by a spray of 4 per cent cocaine to prevent gagging. The indirect method of illumination is used; the cautery point is placed cold on the ulceration and the current applied until the area is well seared. For the epiglottis and arytenoids a pointed electrode is frequently used, and punctures are made into the swollen area in addition to surface cauterization. After treatment nothing is done, except occasional administration of an analgesic for the pain. This rarely occurs, as in the painful cases the cauterization usually at once relieves the pain. The patient is reexamined in one month, and if necessary the cauterization is repeated. Of the last sixty-eight patients operated on, thirty received one cauterization; twenty-three received two cauterizations; six received three cauterizations; three received four cauterizations; three received five cauterizations; one received six cauterizations; one received eleven cauterizations, and one received twelve cauterizations.

Some laryngologists believe that cauterization should not be done if the case is hopeless from a pulmonary standpoint. With this belief I am not in accord. In many cases, hopeless from both a laryngeal and a pulmonary standpoint, the operation is indicated for relief from pain. In such a case a recauterization is not usually urged but is done at the patient's request as a palliative measure.

How long should the interval be between cauterizations? A month, as a rule, but to this rule there are some exceptions.

In the two patients referred to as having had eleven and twelve cauterizations, respectively, the condition was hopeless and the cauterizations were repeated at the patient's request as a palliative measure only. In one, several cauterizations were done at weekly intervals, and no untoward effects were observed, but the pain was markedly relieved.

Other methods for the relief of the intolerable pain include the painting of painful granulations with 10 per cent nitrate of silver, orthoform applied locally, use of cocaine spray and sometimes the injection of 20 minims of alcohol into the superior laryngeal nerve. In this hospital, the last measure is usually unsuccessful, but occasionally it has given wonderful results.

There has been one patient in whom a tracheotomy was required for laryngeal obstruction due to tuberculomas of the cords. This was done twenty months ago. The patient is still wearing the tube with comfort, and the pulmonary condition is much improved.

## SUMMARY

Experience with the electric cautery has led my associates and me to believe that:

1. Electric cauterization will result in healing in nearly all cases of tuberculous ulceration of the tongue if used reasonably early.

2. It is the best method of treatment for the tuberculous larynx that fails to yield to voice rest. With early lesions, complete healing is the rule after a few cauterizations. With most of the advanced cases it is the most efficient method for the relief of the excruciating pain and enables the patient to take much needed food. In many of these cases the condition is not as hopeless as it looks, and healing will often take place following cauterization of extensive lesions.

3. Not the least of the advantages of the cauterization treatment is that it interferes so little with the rest in bed that is so important in the treatment of patients with pulmonary disease.

## LESIONS OF THE EAR

Chronic suppurative otitis media is a comparatively frequent complication of pulmonary tuberculosis, but the tubercle bacillus is rarely

found in the discharge. Owing to the patient's debilitated condition treatment is decidedly unsatisfactory, and the ears will frequently discharge intermittently for years. In this hospital, treatment usually consists of cleansing the canal with alcohol, or alcohol and boric acid and in the acute conditions of applying heat by means of a therapeutic lamp.

No mastoids have been operated on in more than three years. A patient was admitted, however, in March, 1927, who gave a history of operation on the left mastoid the previous July. The wound did not heal, and he was again operated on the following December; this wound was still open when he came to this hospital. No treatment was of any permanent benefit, and after about one and one-half years he became discouraged and left against medical advice. This case was proved tuberculous by laboratory examination.

Three patients with acute mastoiditis were sent to the hospital for operation. One was found to have a positive Wassermann reaction, and the condition of the ear cleared up under antisyphilitic treatment. The other two promptly recovered after free incision of the membrana tympana and application of heat from a therapeutic lamp. One of these patients was of especial interest. He was admitted with an acute mastoiditis of two weeks' duration, and among other definite signs there was sagging of the posterior superior wall, which is usually considered a positive indication for operation. There were, however, some indications for avoiding operative procedures. First, there was a definite attack of facial erysipelas as a complication, and second, the patient had far advanced pulmonary tuberculosis with cavitation. Roentgen examination showed definite clouding of the right mastoid and the right antrum. Conservative treatment of the mastoid was decided on, and a free incision was made in the tympanic membrane and frequent applications of heat by means of the therapeutic lamp were given; later, when the patient had recovered from the erysipelas, the antrum was operated on. He promptly recovered from the condition of the ear, with 20/20 hearing.

## CONCLUSIONS

My associates and I realize that it will be a long time before the last word is said as to the best method of handling the tuberculous patient, but our experience has led us to believe that:

1. Electric cauterization should be more frequently employed in the treatment of tuberculous lesions of the tongue and larynx.

2. Operation on antrum with chronic suppuration will frequently cause a marked improvement in the pulmonary lesion.

3. Operation on the other nasal accessory sinuses can usually be avoided.

4. Too many operations have been done for mastoiditis.

5. In obscure conditions of the eyes, a careful dental examination is imperative.

## ABSTRACT OF DISCUSSION

Dr. Joseph B. Greene, Asheville, N. C.: I wish to make an earnest appeal for a more general use of the electrocautery in the treatment of patients with tuberculosis of the larynx and of the tongue. As St. Clair Thomson says, it is the most effective treatment both for "ease and for cure." In my experience the cautery is best suited to lesions within the larynx proper, the cords, the vocal bands and behind the commissure. Tuberculosis of the pillars of the fauces and the soft palate does not seem to respond so well to the cautery. In these cases, the reaction to the infection is already so great that the electrocautery only makes matters worse. Fortunately, lesions of the posterior wall of the pharynx also respond well to the action of the electrocautery. Every sanatorium should be equipped with the necessary apparatus, with someone in charge who is experienced in its use. The indirect application of the cautery possesses a distinct advantage over the direct method. This method is certainly more comfortable for the patient and avoids trauma of the epiglottis, an important consideration. The indirect method is simple and easy for the operator and comfortable for the patient. It has been surprising how few cases of tuberculosis of the middle ear in adults come to operation for a mastoid infection. I refer particularly to adults suffering with pulmonary tuberculosis. In my experience, only two such patients have come to operation, and one of these might well have been spared the necessity of opening the mastoid. Children with tuberculosis of the middle ear, however, have a different type of tuberculosis, usually glandular rather than pulmonary, which seems more frequently to require operation on the mastoid.

In reference to the advisability of removing one tonsil at a time in the tuberculous patient, I am rather inclined to remove both tonsils at one operation, provided the patient's general condition warrants operative intervention. However, in operating in such cases it is important to avoid trauma as much as possible and spare the patient needless loss of blood. It is well known that tuberculous patients do not stand operations well, and we resort to operation only when the indications are urgent. It is, of course, understood that in the removal of tonsils in the tuberculous, local anesthesia should be used.

Dr. Charles W. Brown, San Diego, Calif.: Dr. Terry's statement, "However badly our dwelling may need repairs, we do not undertake them if the house is on fire," and "no critically ill are given an eye, ear, nose and throat examination unless special complaint is given at time of admittance," I heartily approve, and I think that he has given us an excellent paper.

Ulcerations in the nose, whether definitely tuberculous or not, should be treated by actual cautery or one of chemical nature; to me, trichloracetic acid in its original form has given the best results, and it is applied with ordinary wooden applicators. Regarding operation on the sinuses, in my opinion, patients with moderate or light infections of the chest are benefited by removal of infected tissues, such as polyps in the ethmoids and sphenoids, or by a cleaning up of the infection in an antrum by a naso-antral window or even a radical operation, if indicated. Conditions of the teeth and guns should be charted and treated as soon as the patient's condition permits. Ulcerations of the tongue are usually easily treated if recognized and treated with cautery. Tonsillectomy is to be done when needed, as in nontuberculous patients.

In every case calling for operation, there should be, prior to the operation, a thorough examination, particularly laryngeal.

A man, aged 58, on whom I did a laryngectomy two months ago and who is now entirely recovered from the operation and is working and feeling fine was treated for over one year for syphilis in spite of a negative Wassermann reaction and the absence of other symptoms of the disease and a negative history, and on whom no biopsy was made until prior to the laryngectomy.

I am heartily in accord with Dr. Terry regarding absolute voice rest on finding any pathologic condition in the larynx when there is definite tuberculosis of the chest. "Dead men tell no tales" is a proverb well applied to cauterization of the ulcers of the larynx, for then the patient is more able to eat and put on weight and fight against his infection, and none should be considered hopeless because of an ugly looking larynx. At the present time, I have under my observation four cases of definitely healed laryngeal tuberculosis and two of the patients have been ardent users of a direct sunlight and mirror treatment.

Acute infections of the middle ear should be treated as in other patients, but in chronic cases, cleanliness, zinc ionization, cresatin or boric acid in alcohol should be given thorough trial before submitting the patient to operation.

Bronchoscopy is of vital importance in a hospital for tuberculosis.

DR. THOMAS E. CARMODY, Denver: We have often found that patients who were told that they could only whisper were suffering more injury than those who talked out loud. Dr. Terry spoke of that. Some patients who are told to whisper do it easily, but some strain too much.

The use of the cautery in laryngeal tuberculosis, gives complete comfort in many cases. On the other hand, I recently had a patient who was much depressed over the fact that we suggested the use of the cautery. He said that he had been hurt so many times by a cautery that it terrified him. His physician had used it, making three or four punctures at one sitting. I think that is a mistake, because sometimes it causes more ulceration and trouble than before. If I understood Dr. Terry correctly, he said that he had found the tubercle bacillus in cases of disease of the maxillary sinus. I wish he would speak of that again. The point of taking out one tonsil at a time has been brought up before by the chairman of this Section. As you know, he recommended taking out one tonsil. I have never performed the operation in this way, but in some cases it would be better to do so because some of these patients, even those apparently in perfect health, lose much blood, and the tuberculous patient must be spared that if possible.

DR. THOMAS J. HARRIS, New York: At least two points in this paper should be emphasized: First, the need in all cases of routine examination of the upper respiratory tract, by which I mean the nose, the nasal pharynx and the larynx. The value of such examination cannot be overestimated, and it is too often avoided or omitted. The second point is with reference to the almost constant omission, in sanatoriums, of examination of the larynx. I want to put in an earnest plea that such examination, if the condition of the patient will permit, should be made, and not made by one of the general staff, but by a trained laryngologist. Dr. Terry did not mention the treatment De Reske of New York has been giving by artificial pneumothorax. He reports favorable results in laryngeal tuberculosis. The second point is something I learned last year on a visit to the Finsen Institute in Copenhagen. I learned there, rather to my surprise, that they do not claim that light will cause decided benefit, sufficient to depend on it alone;

therefore, it is their practice to use light not only on the larynx, but also on the body generally, in order to improve the condition of the patient and permit what has been so strongly advocated here, namely, the use of the electrocautery.

DR. G. H. B. TERRY: In regard to the tubercle bacillus in washings from an antrum, it is true that in one case it was found, a case showing no real symptoms of sinusitis. There was no pus and no indication that the patient had sinusitis. This was undoubtedly a sputum contamination. I do not believe we have ever had a patient with tuberculous sinusitis. With reference to the fact that artificial pneumothorax has a good effect on the larynx, I believe that is true. However, we have had two patients in whom artificial pneumothorax was done who developed typical laryngeal tuberculosis. I believe that it does good, but it does not absolutely prevent the development of laryngeal tuberculosis.

# SUBMUCOUS RESECTION OF THE NASAL SEPTUM IN CHILDREN *

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Several years ago, I undertook the partial submucous or modified submucous resection of the nasal septum in children with a view to relieving or ameliorating the symptoms incident to mechanical defects still present in the nose after the removal of the tonsils and adenoids. Knowing full well the antipathy felt by competent operators toward disturbing the nasal septum in persons under 15 or 16 years of age, I performed the operations conservatively. As no unfavorable results were seen following conservative lines, more and more tissue was removed at later operations until a considerable amount was taken out, and the results in fifty patients were published two years later. The paper was favorably received, and with the encouragement of my confrères and because of the continued improvement seen in the patients, the procedure has been carried out until the number of case records is now more than a hundred. The patients have been kept under observation by having them report at frequent intervals. Considering the roving type of patient one has to deal with in a clinic in a large city, the check-up has been good.[1] Concerning the patients not frequently seen, or those who have disappeared from observation, it may be assumed that if there had been decidedly poor results the patients would have let it be known. As so many unsatisfactory results were being obtained in patients suffering from nasal obstruction in whom the tonsils and adenoids had been removed for its relief, it was decided to combine the removal of the tonsils and adenoids and the deflected septum, when present. The reaction was not much greater than that after the removal of the tonsils and adenoids only. Much valuable time was thus saved, as otherwise the patients would undoubtedly be returned to some clinic with the complaint that no improvement was noticeable in the nasal breathing, and pleas to remove the adenoids would again be made. It was a noticeable fact that, barring actually inferior operations on the tonsils and adenoids, recurrent or secondary tonsils and adenoids were practically always associated with the presence of an obstructing nasal septum. In fact, with a history of one or more removals of the

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1. Practically all of the clinical patients were at the Manhattan Eye, Ear and Throat Hospital, Dr. McCullagh's Clinic.

tonsils and adenoids and a further demand for their removal, it became the custom to examine the nasal septum first and then proceed with examination of the throat. This recurrence of secondary growths occurred in one sixth of the patients in the first series and was about the same in the second.

*Relationship Between Septum, Palatal Arch, Head Indexes and Nationality*

| Sex about equal | Heads * | |
|---|---|---|
| | Number | Per Cent |
| Brachycephalic | 104 | 55 |
| Mesaticephalic | 52 | 26 |
| Dolichocephalic | 34 | 18 |

| | Arch | | Brachycephalic | | Mesaticephalic | | Dolichocephalic | |
|---|---|---|---|---|---|---|---|---|
| | Number | Per Cent | Number | Per Cent | Number | Per Cent | Number | Per Cent |
| Normal | 70 | 37 | 41 | 21 | 17 | 9 | 12 | 6 |
| Slight | 3 | 1 | 3 | 1 | .. | .. | .. | .. |
| Moderate | 60 | 32 | 34 | 18 | 19 | 10 | 7 | 3 |
| High | 43 | 21 | 19 | 10 | 14 | 7 | 10 | 5 |
| Very high | 5 | 2 | .. | .. | 2 | 1 | 3 | 1 |
| Flat | 9 | 5 | 7 | 3 | .. | .. | 2 | 1 |

| | Septum | | Brachycephalic | | Mesaticephalic | | Dolichocephalic | |
|---|---|---|---|---|---|---|---|---|
| | Number | Per Cent | Number | Per Cent | Number | Per Cent | Number | Per Cent |
| Normal | 66 | 34 | 42 | 22 | 13 | 6 | 11 | 5 |
| Slight deviation | 7 | 3 | 2 | 1 | 1 | 1 | 4 | 2 |
| Irregular | 18 | 9 | 6 | 3 | 7 | 3 | 5 | 2 |
| Deviation typical | 37 | 19 | 21 | 10 | 11 | 5 | 5 | 2 |
| Marked | 2 | 1 | .. | .. | .. | .. | 2 | 1 |
| Thick | 11 | 5 | 8 | 4 | 3 | 1 | .. | .. |
| Spurs | 47 | 24 | 24 | 12 | 16 | 8 | 7 | 3 |
| Dislocation | 1 | 1 | .. | .. | 1 | 1 | .. | .. |
| Deviation with spurs | 1 | 1 | 1 | 1 | .. | .. | .. | .. |

| Nativity | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Children | | | Parents | | | | | |
| | Number | Per Cent | | Number | Per Cent | | Number | Per Cent |
| American | 179 | 94 | American | 25 | 13 | Spanish | 1 | 1 |
| Jewish | 6 | 3 | Jewish | 80 | 44 | Slav | 6 | 3 |
| Italian | 3 | 2 | Italian | 32 | 17 | American-French | 2 | 1 |
| Slav | 1 | 1 | Irish | 4 | 2 | American-Italian | 2 | 1 |
| Spanish | 1 | 1 | Teutonic | 6 | 3 | Irish-American | 1 | 1 |
| | | | British West Indian | 1 | 1 | Teutonic-Irish | 2 | 1 |
| | | | American-Scotch | 1 | 1 | American-Slav | 13 | 7 |
| | | | English-American | 1 | 1 | Italian-Slav | 1 | 1 |
| | | | Teutonic-Slav | 1 | 1 | Slav-American | 1 | 1 |
| | | | American-Teutonic | 8 | 4 | English | 1 | 1 |
| | | | Swedish | 1 | 1 | | | |

* Percentage only approximate.

Because the deflected septum occurred so frequently in children and in so many types of children, an investigation concerning the relationship between the septum, palatal arch, the head indexes and nationality was undertaken. Approximately 200 consecutive patients (children) about to be operated on for tonsils and adenoids or septal deflections were examined relative to these factors. The results are shown in the accompanying table.

From the table, it would seem that in this particular series, children having brachycephalic (short) heads constituted more than one half of those examined. Among these, 21 per cent had normal arches as compared to the total of 37 per cent for all types of heads. A normal septum was present in 22 per cent as compared to 34 per cent of the total for all patients; in other words, about one third of the children presented normal palatal arches and normal septums for all head types. Regarding parental nativity, only 13 per cent were American born. Of the foreign born, 44 per cent were Jewish and the rest were divided between the British Isles and European continental countries. Of the children, 94 per cent were American born, the balance having the nativity of the parents.

### CHANGES IN THE SKULL FROM BIRTH TO PUBERTY

It might be well at this point to ponder over or consider the anatomic, physiologic and mechanical changes going on in the infant skull from birth to puberty. In no one region of the human body are so many and diverse actions taking place. Except for the fact that sufficient nutriment has been stored in the fetus, no form of nourishment is taken for a number of hours after birth. However, definite structures have already been formed. With the exception of the teeth, the organs for the assimilation of food are practically complete. The special senses—seeing, hearing, etc.—require education or practice only. The nose and accessory sinuses are essentially in the formative state. True, there is a septum nasi and beginning sinuses and antrums, which, however, must share the masses of the maxillary bones with the buds of two sets of teeth. There may be a semblance of ethmoid cells, but the frontal and sphenoid sinuses are not yet in evidence. These are not independent entities, but all are subjected to the same physiologic urge. Manifestly, if a condition of achondroplasia supervenes early instead of at about the age of 22 years, not one but all structures must be involved to a greater or lesser degree. If no septum nasi were ever intended to develop, it is conceivable, all things being equal, that physiologically, both sides would develop equally.

Again, if there were no driving force, there would be no particular length to the nose. One great element enters into this drive—civilization. The human head is the index. This being true, one structure in particular is the sufferer. As the cranial cavity is increased in size to accommodate the physiologically enlarged brain, the downward and forward presssure on the septum, which is locked in by the bones of the face and the hard palate, must of necessity try to make its escape anteriorly or do the next best thing, deviate or crumple. With higher civilization comes comparative ease of development; this may be exemplified by the better preparation of foods. Mastication is as normal

an act as walking and is just as essential. From the instant an infant suckles, all motions concerned in the obtaining or preparation of food for the gastro-intestinal tract should tend to keep the hard palate down, or at least but a little above the level of its periphery. The beneficial action of strong pressure along the alveolar processes, the result of a resistant body being crushed between the upper and lower jaws by the mighty force exerted by the muscles of mastication, appeals to all as being not only a logical but a highly scientific engineering feat in keeping the center of the arch down. If this natural process is allowed to work itself out after the arch has been held down by suction during lactation, with the appearance of the temporary teeth a combined action is instituted. All the deciduous teeth (twenty in number, or ten in each jaw) have made their appearance at about the second year. A gradual migration of the permanent teeth begins at about the fifth or seventh year and continues up to about the seventeenth or twenty-second year. There are thirty-two permanent teeth, sixteen in each jaw. Therefore, a grand total of fifty-two teeth have been born, raised and sent forth to labor. From two blocks of bone, the superior maxillae, half of this number have been derived, but their places to a certain extent have been replaced by the antrums. About the time the permanent teeth have completed their eruption, the frontal sinuses have reached their normal size. The sphenoid is demonstrable about the time the permanent teeth start to erupt. From the foregoing statement, it might seem that an indictment of the nasal septum is sought. To the contrary, it is sought to free—almost to exonerate—the nasal septum by removing it from the jurisdiction of the court of errors. The great hue and cry has been, "Don't destroy the vital center or centers of ossification by performing a submucous resection of the nasal septum in a person under 15 or 16 years of age." The ethmoid ossifies at about the end of the seventeenth year; the vomer, composed of two parallel plates, completes its union at about the fifteenth year, but the perpendicular plate of the ethmoid unites with the vomer at about the forty-fifth or fiftieth year of age. How long, then, shall one wait?

Trauma still stands high in the category of causes for deflected septums, but this must of necessity be hearsay to a great extent, for no normal child goes through life without a few falls. There is, however, another form of trauma that may be somewhat of a determining factor, namely, trauma at birth. Even under the most ideal circumstances, more than a third of all normal infants show wobbly eyes (nystagmus) at birth, as a result of cranial compression. It must be remembered that at birth the cranial base is relatively rigid and the nose comes in for its share of pressure, normal or otherwise. The nasal septum, although highly flexible, certainly has at least a squashing if not a breaking point. No doubt, some of the massively thickened

septums are thus caused. As no intranasal examination is ever made at birth, data as to any intranasal injuries at birth are not available. Both the eyes and the ears have been the objects of special examination at more or less frequent intervals after birth.

When nasal breathing is faulty, there supervenes a catarrhal process of varying degree of the mucous membrane, and by extension the lining membranes of the accessory sinuses may become affected. The latter condition is augmented by faulty ventilation. In the nasopharynx, the eustachian tubes become involved, causing an ascending inflammation of their linings and a consequent catarrhal otitis media—a beginning catarrhal hardness of hearing. When drainage is interfered with, mucus or mucopus passes backward, bathes the posterolateral walls and may cause an otitis media suppurativa, either acute or chronic. Other lesser conditions are epistaxis, due to drying of the discharge followed by formation of a scab, granular pharyngitis alone or with some acute lateral pharyngitis simulating tonsillitis, aches, pains, malaise and fever. The last mentioned condition is seen most frequently in children already tonsillectomized. The untoward effects of accumulated mucus or mucopus are to be noted not only in the immediate neighborhood of the nasopharynx. Children are prone to swallow all discharges rather than to expectorate or try to get rid of them by ineffectual blowing of the nose, even if old enough to attempt it. Thus, a train of gastro-intestinal symptoms makes its appearance, such as anorexia, anemia, inability to gain in weight, listlessness or general lack of interest during the day and restlessness and fitful sleep at night. The foregoing symptoms may grudgingly yield to much medication and much regulation of diet. The "adenoid facies," although not as marked as before the operation on the tonsils and adenoids, does not improve as it should; the patient is not a perfect nose breather. Lung capacity is frequently restricted, and the inspired air passing directly through the mouth into the lungs may set up various inflammations. The situation is still further complicated by the accumulation of mucus or mucopus in the laryngopharynx, which has a tendency constantly to seep into the larynx and trachea, not infrequently causing violent paroxysms of coughing. A slight fever may or may not be present.

If the result to be obtained by performing a submucous resection is borne in mind, fewer radical operations would be performed even in adults. The objects for doing a submucous operation are: (*a*) to facilitate true nasal breathing, (*b*) to facilitate natural nasal drainage and (*c*) to facilitate both nasal breathing and nasal drainage, thus insuring better ventilation of the accessory sinuses and tympani.

Let us consider, therefore, a plan not only to satisfy all concerned but to justify surgical intervention when the septum is causing marked obstruction to nasal breathing in young persons. As already noted,

this operation is far from being as radical as that in the adult. The inherent difficulties due to the smallness of the nasal cavities are self-evident.

All the instruments, however, are of regulation size except the Jansen-Middleton forceps, which is one-third smaller. Instruments for the removal of the septum should be biting forceps and preferably a through-and-through biting model.

### TECHNIC

Pure epinephrine is applied by means of a long, thin layer of cotton on each side of the nasal septum, and is allowed to remain in place for from twenty to thirty minutes. Before ether is administered, these strips of cotton are removed. A suitable tampon of gauze with a strong silk suture in one end is inserted into the nasal chamber, on the same side on which the incision is to be made, and packed posterior to the junction of the anterior and middle thirds of the nasal septum. The suture referred to is allowed to hang outside the nose toward the corresponding ear. The postnasal plug is not used. The usual incision is made in the convex surface of the septum. Instead of a knife, a fair-sized, sharp curet is used for cutting through the septal cartilage. The space thus obtained gives freedom of movement for separating the mucous membrane of the opposite side under direct visual guidance. The separation of the membrane on the concave side may be dispensed with entirely, as will be noted later. If both mucous membranes are separated, the next step is to remove a strip of cartilage and bone from before backward, as far as necessary, and this means including the ridge and spurs as far back as necessary.

The height to which cartilage and bone is to be removed will depend on the degree of deflection of the septum. The amount of tissue removed should be a little more than that of the tissue which is to replace it. The next stage is the replacing, transposing or transporting the septum to its new location. There is some space below, and if the curet for cutting through the septal cartilage is fairly large, there is space anteriorly. The new septum-to-be can move in two directions, downward and forward.

The cartilage can be taken care of in several ways: First, if the deviation is only moderately high, an incision from behind forward is made in the concave side but not completely through to the convex side. This allows of what might be termed a "pseudo green-stick fracture" when pressure is exerted on the convex side. If the deviation, however, is so high that this is impracticable, then three or four incisions completely through the cartilage, from below upward, almost to the dorsum and close to one another, may be made, forming three or more vertical fingers of cartilage. Superficial nicks are made in their points of greatest concavity. Packing is placed in the nose on the side of the convexity only; this allows the membranes to become adherent, thus holding them in place permanently. In other cases, when it is too tedious and would cause too much trauma, the membrane on the side opposite the incision is not elevated, but transfixed with the cartilage and both swung into place. This must be done posteriorly to the primary incision. In other instances, when a long bowing of the cartilage is present, an oblique incision on the concave side from above downward and forward may be made. This incision goes through the cartilage but not into the mucous membrane on the convex side. This also allows moving the cartilage to the midline. It is not necessary to remove cartilage in proximity to the dorsum of the nose or the perpendicular plate of the ethmoid. The former requires sup-

port, and the latter will give no support, as it shelves from above downward and backward. The perpendicular plate of the ethmoid should not give great concern. Like all bones in children, it will bend markedly before breaking completely. If the subject is young and sufficient space has been made inferiorly, in many cases the perpendicular plate in the course of a few weeks or months will assume a real perpendicular position, due to the constant traction of the contracting mucous membrane. If deemed necessary, the plate is grasped firmly with flat-bladed forceps; without the least semblance of twisting or rotating above the point where it is grasped, gentle, firm and slow force is exerted to cause a slight solution of continuity on the side of the concavity. A piece of Bernay sponge cut to fit is then inserted opposite the convexity and left in place for two, three or more days. After the first day, a few drops of one of the mild antiseptics is instilled once a day for cleansing purposes.

One other form of obstruction not infrequently gives trouble, namely, subluxation of the septal cartilage. If the condition is looked on not as a result of trauma, but as an abnormal or double septum, the problem is not so grievous. The usual incision is made, and the "wing" of cartilage corresponding to the side of the incision is removed to considerably above the respiratory space. The "wing" on the opposite side is undermined and sufficient is removed inferiorly to allow it to be swung to the middle line and to be able just to rest on the lowered ridge of the septum. Resilience is overcome by a superficial cut into it on the side opposite the initial incision. The side opposite the incision is packed firmly to hold the "wing" in place, and light packing may be put into the same side.

## DANGERS

No tissue should be removed in the region of the junction of the lower lateral cartilages and the septal cartilage nor the junction of the septal cartilage and the perpendicular plate of the ethmoid high up, as the latter shelves backward from above downward. This is extremely important. Neither a rocking forceps nor a swivel knife should be used to remove the septal cartilage. The initial incision should not be too high nor too far back. Great care must be used to avoid the formation of hematomas; abscess is disastrous.

## CONCLUSIONS

1. There is a positive need for some form of relief from obstructed nasal breathing in children before the age of puberty.

2. The form of relief must be along normal physiologic lines.

3. No interference with the normal growth of parts is justifiable.

4. The delegating of one part to do the work of another part never produces a normal physiologic result. Mouth breathing can never successfully supplant nasal breathinig.

5. Removal of aberrant or excessive tissue does not interfere with the normal functioning of the primary stock.

6. No person not well qualified to perform the classic operation in the adult should attempt the operation in a child. Unfavorable results must follow.

7. The best guard against sinusitis is perfect drainage; this is attainable only by means of the physiologically perfect nose.

8. Hearing is dependent largely on normal air pressure within and without the middle ear, and obstructed nasal breathing militates against such a state.

9. A septal operation is preferable to an operation for pansinusitis.

10. The modified submucous resection of the nasal septum complies with the foregoing statements.

## ABSTRACT OF DISCUSSION

Dr. Frank B. Kistner, Portland, Ore.: The contention that cephalic development produces changes in the structure and lays the foundation for deviation of the septum always seemed to me to have its weak points. I was much interested two or three years ago in reading an account of the researches of Dr. Hurd on this subject. He began his researches with the embryo and followed them by work on the fetus and on infants and young children, and proved conclusively, at least to his own satisfaction, that deviations of the septum are laid down in the embryo. He looked for material to back up his argument and selected patients in whom the septum was gone below the palatine fissure and there was no support at the bottom; he found that these patients did have deflection in the horizontal or perpendicular plane.

A few years ago when we looked forward to orthodontic procedure to relieve us of the necessity for operating on children, I was quite enthusiastic about it. The results were disappointing, and if Hurd is right that may be why we were facing the situation of basing orthodontia on the wrong hypothesis. My own experience in operations on the septum in children has been limited. It has been confined to the more extreme cases. I have seen no ill results following the operations that I have performed, and yet today I always approach this operation with a certain amount of timidity.

Dr. A. D. McCannel, Minot, N. D.: I have always felt that it is not good practice and a dangerous procedure to operate on a growing child on account of disturbing the ossification centers. My experience with submucous resections in children is limited to a few extreme cases, especially those of an anterior vertical deviation. I have never interfered with the vomer. However, Dr. White has brought up a question that will start all of us thinking seriously as to the wisdom of this procedure in these troublesome cases of recurrence of obstruction in the breathing in children whose tonsils and adenoids have been removed. In the past many have attempted to obtain these results by removing the free borders of the turbinates, which I think is a poor surgical procedure, and is only mentioned to be condemned.

The essayist's description of the operation itself was not quite clear to me, and I would like to ask whether he does not have trouble in keeping the cartilage in place, following the slitting and thinning of the convex portion of the deviation. I have always felt that to get a good result it was necessary to remove all the deviated cartilage so that there would be no deviation of the cartilage that would require pressure to bring it into place during the healing process.

Dr. Wendell C. Phillips, New York: Dr. White has changed some of my preconceived ideas as to the wisdom of operating on the deflected septum of young children. There is no question as to his results, because he has carried on this work in a most scientific manner backed up by reports of a large number

of cases. I am inclined to think that in selected cases this operation will prove of extreme value and hope that it will be taken up seriously.

There seems to be little actual destruction of tissue in this operation. It must be true that the relief gained will permit the child to develop with less tendency to diseases of the sinuses and throat and the infections that keep the adenoid tissue from recurring from time to time.

Dr. Lee W. Dean, St. Louis: It seems to me that there are in certain instances definite indications for operation on the septum in very young children. In a case of systemic disease with a paranasal sinus disease which will not yield to treatment, in which the nephritis or some other disease is secondary to the sinus trouble, it seems to me that in that instance operation on the septum is justifiable. On the other hand, I feel that only in a large hospital service will it be necessary to operate in more than two or three cases in the course of a year. It seems to me that, with the sinus infections which are present and which sometimes can be eradicated without operation on the septum, if these sinus infections are treated, if the endocrine disturbances which are so often present and exert an influence on the nose so as to interfere with nasal breathing are corrected and if the allergic question is gone into and the adenoids removed, in a majority of cases with some simple treatment of the mucous membranes and with the development of the head, the nasal breathing will become quite normal and operation on the septum will not be indicated. In short, in my judgment, before operating on the septum one should do everything possible to bring about normal breathing. Not only should the local condition in the sinus and the nasopharynx be gone into, but the general condition of the patient should be investigated carefully; the allergy and the endocrines, and the diet should be studied, for all these things have an influence on nasal obstruction.

Dr. George L. Richards, Fall River, Mass.: I have always been timid about attacking the septum in young children. I have tried out a simple procedure which does not interfere with the development of the septum and at once provides nasal breathing. A submucous resection, if required, can be done several years later. This operation, which is done under general anesthesia, consists in separating the anterior base line of the cartilage from its attachment to the nasal process of the superior maxilla by means of a narrow thin chisel and the making of one or two vertical cuts through the cartilage at its point of greatest convexity. This removes the elasticity of the cartilage which can now be easily shaped with the finger and straightened. No portion is removed. A Kyle hollow malleable splint, of as large a size as is freely and easily introduced, is now introduced on the convex side. This remains unchanged for two or three days, when it is removed for cleansing. It is replaced and thereafter changed daily. It is borne without pain. A smaller size may be required a week or so later. I try to have this splint worn for from three to four weeks, at the end of which time complete healing of the cuts has taken place. The cuts are preferably made obliquely to the plane of the septum. I have followed some of these cases for several years, and nasal breathing has continued through the previously obstructed side. This operation is not as thorough as that of Dr. White but has answered the purpose well and has the advantage that no portion of the septum is removed and that there is no interference with the future development of either cartilage or bone.

Dr. Edwin McGinnis, Chicago: Dr. Dean emphasized two sorts of cases that do not really require surgical intervention—the allergic case and the case due to faulty feeding. Another group of cases actually requires surgical intervention, and I, like everyone else, have been worried about what would happen

to the noses in these cases. I have used the same technic in operating on children as I have on adults. The youngest child I operated on was 4 years of age. I performed the operation under general anesthesia, but I worried year after year as to what would happen to the nose. I followed the case for ten years, and nothing developed; the nose has not been operated on again; the septum is straight, and the child has good nasal breathing. Last year I had as a patient a child who had lost his hearing; on examining the nose, I found infection of the nasal sinuses and a thickening of the cartilage of the septum; it seemed urgent to do something for this patient in order to help his defective hearing. All of the allergic states and the diet were investigated. I did a rather high submucous section and infracted the middle turbinates. With inflation of the eustachian tube and follow-up treatment, this child regained his hearing. I have tried to preserve the septal cartilage; in two or three cases I went too far back, and as years went by, with the growth of a cartilaginous septum bulging appeared to the convex side, which produced obstruction. I usually make my incision through the soft parts and then make the cartilaginous incision farther back. In three cases, I made the incision too far back and got a deflection of the cartilage from further growth. I will have to do a subsequent correction to get rid of the obstruction.

Dr. Lyman G. Richards, Boston: My earliest recollection of the science of rhinology was a septum operation on myself, by a most efficient rhinologist, done not under general, but under local anesthesia. That, however, was before the proposed use of the Kyle splint, which in my hands has been a rather unsatisfactory procedure. It is a difficult thing to maintain replaced cartilage in position, owing to the extreme tension and elasticity of the cartilage, particularly in children; my experience has been that the use of the Kyle splint over a long period results in a good deal of nasal suppuration and has to be given up, and that after a while one will find that there has been a return of the position of the cartilage. I have had a good deal of success in such cases in letting the cartilage alone and in not attempting violently to fracture the maxillary rod which carries the lower end of the cartilage to the opposite side. It may not straighten out, and it may result in increased stasis in the inferior meatus. Under those circumstances, it may be necessary to do a subsequent submucous resection.

I agree with Dr. Dean that many of these patients may get well without operation; but when parents bring a child with the statement that there is a tumor in the nose, and one hopefully looks for some unusual growth and finds complete closure of the nasal lumen on one side, it seems to me to be in order to restore nasal function. One point of Dr. White's paper is the multiplicity of incisions over the cartilage. This comes nearer to breaking up the tension that interferes with the permanence of the central position of the septum than anything else.

Dr. Nathan P. Stauffer, Philadelphia: I do not know just what Dr. White means by "children," whether he means subjects of a certain age or not. I work with 1,600 boys, from 6 to 18 years of age, who live in one place. I have done more than 100 submucous resections, and I have seen no ill results. A tonsillectomy is usually done first, because if the submucous resection is done first tonsillitis often follows and then the tonsils must be removed later. A local anesthetic is used. The patient is placed in the supine position, and cocaine, 1 per cent, and 1:1,000 epinephrine hydrochloride are used. No tetany has been seen. The septum should be entirely removed, except for a small bridge. As Dr. Kistner said, if the old Ash operation is done, there will probably be a return. I have never found anything satisfactory for holding the septum without taking out the entire deviation.

Dr. Francis W. White: Regarding holding the cartilage in place, if a definite amount is removed from below, then a few incisions made in the concave side and pressure is made on the convex side, one will get practically a green-stick fracture. There is solution of continuity of surface of the concave side, while on the convex side there is continuity of surface. That is what I mean by making the incision so as to reduce the resilience of the cartilage, thus allowing it to be put in its new position and held there. These operations have been done over a period of nine years, and in none of them have I seen the necessity for doing a secondary operation. The breathing space has been sufficient to allow for any pressure that may be required to bring the septum into the middle line. As to Dr. Dean's attitude, I agree that many patients will get along well without operation. This operation is one of necessity. Dr. Stauffer spoke about the age. The youngest child was 4 years of age, and the oldest 15, an average of 9+. Tonsillitis frequently occurs after a submucous operation if the tonsils have not been removed first. We do not do a submucous resection, in children particularly, with the tonsils in situ. In answering Dr. McGinnis, in the cases referred to, the deviation was high. One cannot reduce the resilience by high removal of the cartilage without danger to the bridge. The incision or incisions should be made almost up to the dorsum. Then little nicks are made on the concavity, and when one presses on the convex side one produces a green-stick fracture, and in a week or ten days the shape will be perfect.

I do not leave the packing in over a week or ten days. If I see the least tendency of the cartilage to snap back, I repack.

To those who wish to do this operation on children, I would suggest that they do not start with very young subjects.

# ALLEVIATION OF PAIN IN PERITONSILLAR ABSCESS

## REPORT OF A METHOD INVOLVING COCAINIZATION OF THE PALATINE NERVES PASSING THROUGH THE SPHENOPALATINE GANGLION *

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Any one who has suffered the agonizing pain associated with a peritonsillar abscess, or who has had occasion to observe those so afflicted, can well understand the reason that prompts a search for some method of alleviating the pain. Until relief has occurred by incision or spontaneous evacuation, these people suffer untold agony and in addition are unable to open the mouth, chew or swallow. Consequently they are exhausted not only because of the persistence of the excruciating pain and its ensuing insomnia, but also because of the deprivation of food and water. Frequently the pain is so great and the inability to open the mouth so pronounced as to prevent the physician from making a proper examination or performing the necessary incision. The only relief to date that one may offer to those with this condition has been the obtundation of the pain by various analgesics and narcotics, and not infrequently these are but of little value.

Pain, broadly speaking, may be alleviated in three different ways: (1) by obtunding the local area in which the pain impulses originate, (2) by obtunding the transmitting mechanism including the various nerve trunks and their associated sensory ganglions and (3) by obtunding the central perceptive areas in the brain. So far the last has been the point of attack by the use of the various analgesic and narcotic medicaments. In local areas of marked inflammation the use of cold or heat to improve the circulation and relieve congestion is all that can be offered. The local injection of obtunding solutions is impracticable for two main reasons. First, there is danger of spreading an existing infection and second, it is well known that the efficacy of a drug producing local anesthesia is reduced to a minimum and even may be ineffective when injected into an inflamed area. As the use of various drugs to obtund pain in the conscious centers has not been so successful and local injection cannot be utilized, there remains but one other point of attack, namely, the conducting nerve trunks and their associated ganglions.

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The anesthetization of nerve trunks and ganglions in surgery is too well known to require any comment. The tendency in local anesthesia to employ injection into specific nerves or their ganglions in order to effect an anesthesia in the area which they supply, rather than a wholesale infiltration of the region in question is also common knowledge. In certain types of neuralgia injection into the nerve trunk or its sensory ganglion to obtund pain is an accepted procedure. Injections of alcohol into the various branches of the trigeminal nerve or the semilunar ganglion for relief from pain in tic douloureux are common occurrences. More recently the use of paravertebral injections in angina pectoris and other painful conditions is becoming more popular.

Relief from pain in the peritonsillar area by such methods requires a consideration of the nervous mechanism supplying it. Roughly speaking the nerve supply has its origin from the palatine branches of the fifth nerve and the tonsillar branches of the glossopharyngeal nerve. The upper two thirds of the tonsillar area is supplied from the palatine nerves and the lower third from the glossopharyngeal. The descending palatine nerves arise from the trigeminal and pass through the sphenopalatine ganglion. This ganglion also known as Meckel's or the nasal ganglion lies in the pterygopalatine fossa of the sphenoid bone, just behind and lateral to the posterior extremity of the middle turbinal of the nose. Coursing directly down from the pterygopalatine fossa is the pterygopalatine canal. This canal contains the palatine nerves that come from the sphenopalatine ganglion and make their exit through the palatine foramina that is located just 4 mm. medial to the last molar tooth. From here the posterior and middle branches course downward and are distributed to the upper two thirds of the tonsillar area.

It so happens that the pathologic process in peritonsillitis and peritonsillar abscess formation is located in the loose areolar tissue that binds the tonsil to its enveloping pillars and practically always in the upper and anterior portion of the peritonsillar area. This area, as has been shown is innervated by the palatine branches of the fifth nerve that passes through the sphenopalatine ganglion. Therefore, blockage of the nervous impulses along this route will effectively relieve pain resulting from peritonsillar inflammations and suppurations. Furthermore, it will anesthetize the site of the region in which the classic incision for peritonsillar abscess is made. This nerve block may be conveniently performed in two places. First, it may be performed in the region of the exit of the palatine nerves from the posterior palatine foramina. A needle puncture 4 mm. medial to the last molar tooth will enable one to deposit fluid in and about the nerve trunks to effect an anesthesia. This is not infrequently performed in local anesthesia for tonsillectomy. But as the site of the puncture is always affected

in peritonsillar infections, it cannot be used for this condition. Second, injections into the nerves may be performed (by the way of the nose) as they pass through the sphenopalatine ganglion. If one takes a long needle and introduces it into the nose in such a manner as to cause the point to enter the lateral nasal wall just behind and lateral to the posterior end of the middle turbinate and points the needle toward the cheek, it will enter the pterygopalatine fossa in which the ganglion and the connected palatine nerves lie. The deposition of a local anesthetic fluid will effectively anesthetize the area supplied by these nerves. The ganglion and the associated nerves usually lie close to the mucous membrane of the nose and it has been found that even a topical application of cocaine to the mucous membrane in this region will effectively anesthetize these structures by diffusion of the cocaine through the mucosa. Advantage has been taken of this fact to cocainize the ganglion or medicate it in cases of a peculiar type of unilateral headache known as Sluder's syndrome. This unilateral pain of a characteristic distribution is relieved within a short time after topical application of cocaine to the region of the mucosa overlying the sphenopalatine ganglion, without the necessity of an injection. It follows that the nerves may be affected at the same time.

Several years ago I was confronted with a case of severe peritonsillitis. The pain was so excruciating as to prevent the patient from opening his mouth to permit inspection. In order to open the abscess it was thought necessary to resort to a general anesthetic, but the patient demurred and inquired if local anesthesia could not be employed. Just preceding him a patient with a typical Sluder's syndrome had been treated by topical application of cocaine to the region of the sphenopalatine ganglion, and the thought occurred that the palatine nerves could be anesthetized in this manner to permit incision of the abscess. This was tried and to the surprise and the delight of the patient not only was the pain relieved after a short period of time but he could open his mouth and drink a glass of water, the first in three days, with but little discomfort. The incision, however, was not entirely devoid of pain but was less than that usually observed. During the past two years there has been occasion to try this method in twelve more cases. The uniform alleviation of pain and discomfort that accompanied the topical application of the cocaine to the region of the sphenopalatine ganglion was gratifying.

### TECHNIC

Under good illumination, preferably with a head mirror and reflected light, a nasal speculum is introduced into the anterior nares of the side affected. A cotton-tipped applicator dipped in a 10 or 20 per cent solution of cocaine is introduced into the nose under inspection until the tip lies just behind the posterior end of

the middle turbinate. The portion of the applicator in the hand is turned toward the median line so as to point the cotton-tipped portion against the lateral nasal wall. It is firmly held in this position for several minutes until the desired relief is obtained. In cases in which the middle turbinal is large or bulbous, it may be necessary to bend the applicator so as to fit in the region desired. This may also be necessary in the presence of a crooked septum.

## CONCLUSIONS

1. Peritonsillar infections for the most part are located in the areolar tissue in the anterior and superior portion of the tonsillar area, between the so-called tonsillar capsule and the pillars.

2. This region is innervated by the palatine branches of the fifth nerve that pass through the sphenopalatine ganglion.

3. The ganglion and the associated palatine nerves may be effectively anesthetized by the topical application of cocaine against the lateral nasal wall just posterior to the posterior end of the middle turbinate.

4. Pain in peritonsillar infections may be controlled in this manner, and a practically painless incision for peritonsillar abscess may be performed by its use.

NOTE.—My attention has been called to the fact that Hoople of Boston has described this method previously, and I therefore wish to credit him with the priority in its use.

# IS STUTTERING A MEDICAL PROBLEM?*

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At present, the treatment of persons who stutter is for the most part in the hands of laymen, either honest but unversed pedagogues or downright charlatans—the "stammering schools." In some of the larger cities, the board of education has a speech improvement department. At the head of this department is a layman, who not infrequently holds the position by virtue of political influence, and the actual treatment is carried on by the regular school teachers, who may or may not have had any special instruction in disorders of speech. If they have been fortunate enough to have taken a post-graduate course, this has been in the department of elocution or public speaking of some college. Nowhere has it been demonstrated to them that they are dealing with a pathologic entity, a neurosis. Consequently, they regard stuttering as a phonetic disturbance, which it is not. So much for the sincere but mistaken pedagogues.

The "stammering schools" are of two kinds—residential and correspondence. Both are characterized by the "cure guaranteed" method. Their literature is full of testimonials. Not infrequently the quack in charge of the school is the author of a ponderous book on the cure of stuttering, privately printed, of course, and nothing more than an advertisement for his school. The method of treatment is usually a new discovery, held as a great secret. These schools are thriving and becoming more and more prevalent, for publicity pays. On such stuff the victims of stuttering are fed.

The fault lies mainly with the medical profession and with the institutions of learning. I know of no medical school in which the subject of disorders of speech is considered a part of the curriculum. In fact, they are not even mentioned. Surely, if physicians disregard this condition as a medical problem, they cannot expect the laity to do differently. As a result, the persons affected turn to the school teachers and to the fake "stammering schools." In this paper I shall try to show that stuttering is a medical condition, a disease, and intelligent treatment can be given only under the supervision and direction of the physician. As soon as this is realized, the frequency of stuttering will be diminished, and this too long neglected subject will begin to be placed on a scientific basis.

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## CLASSIFICATION OF SPEECH DEFECTS

Disorders of speech may be classified under two general headings: (1) stuttering and stammering and (2) defective phonation. Under the head of defective phonation are included aphasia, lisping, persistent infantile talk (baby talk), nasality, hoarseness, falsetto voice, imperfect pronunciation, phonasthenia (voice fatigue), lalling, undeveloped or retarded speech, perverted speech (idioglossia, coprolalia, echolalia), negligent speech and foreign accent.

## STUTTERING AND STAMMERING

In Europe, especially in Germany, these two conditions are differentiated. Stuttering is considered to be difficult speech, and stammering incorrect speech. In this country, the former is associated with the reduplication of sound and the latter with hesitation in speech. Other writers distinguish between these conditions by attributing one to failure in pronouncing the consonants and the other to failure in pronouncing the vowels. None of these distinctions are true. One finds in the same person reduplication and hesitation and failure to pronounce both the vowels and the consonants. As the etiology, pathology, symptomatology and treatment are alike in both conditions, I feel warranted in considering stuttering and stammering synonymous terms.

*Etiology.*—Heredity is an important factor, for it is undoubtedly true that stuttering is found in succeeding generations, but this must be distinguished from what is imitation from contact and what is really due to a neuropathic taint. Temperament and emotional instability are causes to be considered. Even a casual study of a group of stutterers will reveal disorders of personality. These persons are hypersensitive, introspective, morose, shy, easily excited, hyperactive, secretive, melancholy, suspicious, overanxious and absent-minded, and they present inferiority complexes, behavior disorders, sexual perversions and antisocial traits. These may be considered in the nature of predisposing causes. Then there are the exciting causes: mental shock and psychic trauma. In addition there is a general muscular spasticity. The psychanalysts think of stuttering as the outward expression of an internal conflict. Considering all this, stuttering may be defined as a spastic coordination neurosis based on a mental conflict.

*Symptoms.*—The stutterer betrays himself as soon as he speaks. The character of the defect is not constant, but depends on the emotional status at the time. A stutterer does not always stutter on the same sound, though the most common ones are the labials, *p*, *b*, *m* and *w*. There are special forms of stuttering, such as inability to begin, inability to introduce, hesitation, reduplication of sounds, inability to telephone, inability to speak certain words, inability to speak when suddenly

addressed, failure in the middle of a conversation and the use of starters, such as "er," "eg," "yes" and "well."

The breathing is jerky, or the person may be speechless. This is due to the spasticity of the abdominal muscles and the diaphragm. The presence of the hard monotone is due to spasm of the laryngeal muscles. Failure on the sounds *p*, *b*, *m* and *w* is caused by spasms of the lips, and failure on the sounds *t* and *d* is caused by spasms of the tongue. Tics and facial grimaces are due to spasms of the muscles of the face. The rapidity of speech is caused by nervous anxiety.

Finally, there are some characteristic physical symptoms: an exaggerated dermographia, flushing of the cheeks, an increased pulse rate on talking and a further increase on stuttering, a high systolic blood pressure, arrhythmia, cardiac palpitation and profuse perspiration.

*Examination.*—Every stutterer, if he is to be treated scientifically, should undergo a thorough examination, consisting of: (1) the obtaining of the history, (2) and a physical, (3) mental, (4) vocal and (5) phonetic examination. It is obvious that the history must be obtained and the physical examination made by a physician. The mental examination may be made by a trained physician or a psychologist, and the phonetic examination by a physician, a psychologist or a teacher. The rendition of this examination alone demonstrates that stuttering is a medical problem.

A complete history is of prime importance in determining the heredity and the nervous background. Any history that does not cover three generations is of little value. The developmental period, previous illnesses, injuries, operations, habits and school progress should be investigated. A study of the home and social environments is important.

The physical examination may bring out an underlying cause of the speech defect. A right hemiplegia suggests a lesion involving Broca's area and producing aphasia. Hemiatrophy of the tongue will produce difficult articulation. Deafness is another cause of inability to speak properly. Endocrine dysfunction should be investigated. How can a layman find these conditions?

In the vocal tract there are numerous possible causes of defective speech. Though stuttering is primarily a mental affliction, there are physical factors that may act as aggravators; unless these are removed, cure is impossible. The most common aggravating factors are intranasal obstructions, hypertrophied tonsils, adenoids, laryngeal neoplasms, paralysis of the vocal cords, tuberculosis and syphilis of the larynx, otosclerosis, aural discharges, high, narrow, arched or cleft palate, velar insufficiency, prognathism, intrusion or obtrusion of the dental arches, improper activity of the upper lip, a short under lip, harelip, tongue-tie, tumors and paralysis of the tongue, a short, elongated or abnormal uvula and overshot or undershot jaws.

The phonetic examination consists in determining the sounds on which the stutteter fails. The following scheme is comprehensive.

1. Labials: *p, b, m, w, wh.*
2. Labiodentals: *f, v.*
3. Linguadentals: *th* (soft), *th* (hard).
4. Anterior linguapalatals: *n, t, d, l, g* (soft), *j, s, sh, zh.*
5. Posterior linguapalatals: *g, k, c* (hard), *ng, x.*
6. All the vowel sounds: *a* as in lace, as in bare, as in flat, as in flaw, as in star, as in amid; *e* as in weal, as in less; *i* as in will, as in bird; *o* as in boot, as in book, as in note; *u* as in stub.

## TREATMENT

The treatment is based on a comprehension of the etiology and mechanism of speech. In chart 1 there is a schematic representation of the normal speech reaction. There is a stimulus to speak. This

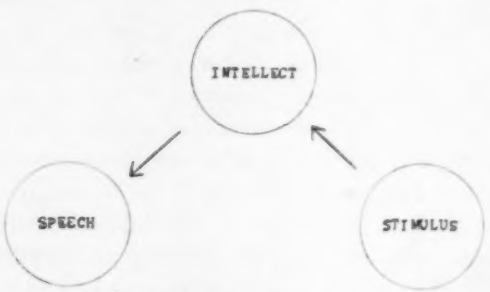


Chart 1.—Normal speech reaction.

travels along the afferent paths to the intellect and then along the efferent paths to the speech organs; normal speech is the result.

In stuttering there is an emotional instability affecting the speech zone area. This is represented in chart 2. The passage of the impulse is shunted; instead of reaching the intellect it travels uncontrolled to the speech organs via the emotions. The result is stuttering.

Assuming this mechanism to be true, the treatment must of necessity be directed toward overcoming or neutralizing the emotional obstacle. This is accomplished as shown in chart 3.

In stuttering, the treatment is a difficult and tedious task. The patient should be told at the outset that the situation is difficult; that a cure is possible; that the process is slow, and that improvement at the end of six months is a favorable omen. Treatment in classes may be necessary because of economic conditions, but the best results are obtained in private sessions. With this clear, one may proceed with the actual treatment, which is medical, surgical, psychotherapeutic and reeducational.

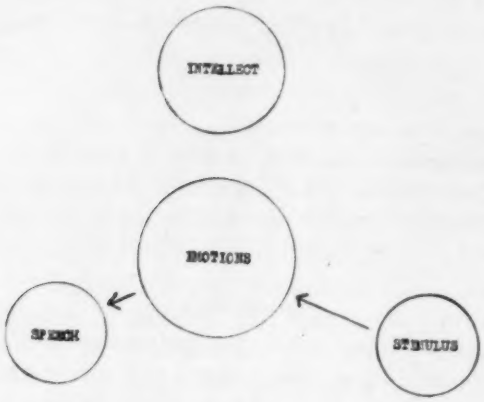


Chart 2.—Speech reaction in stuttering.

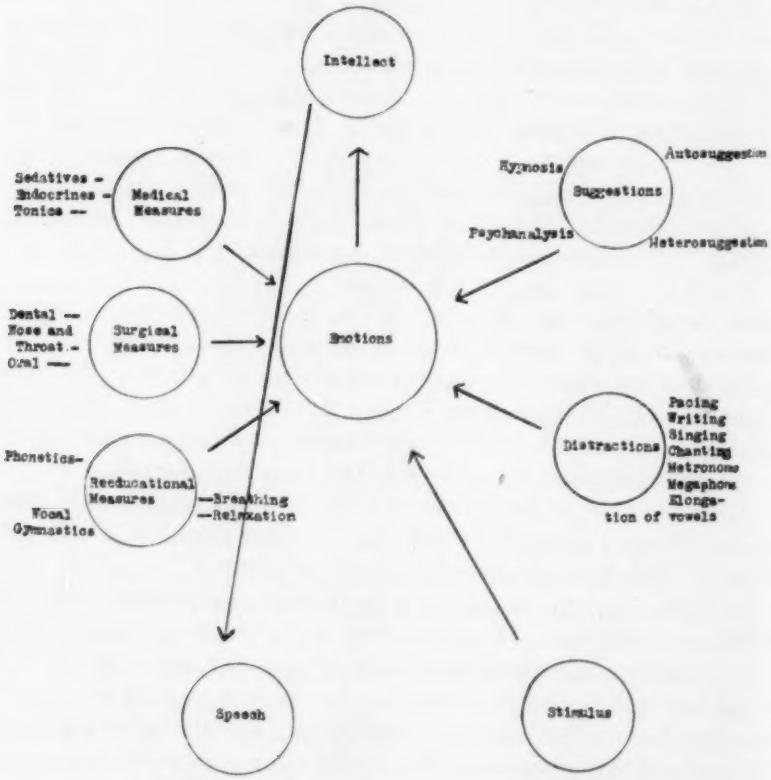


Chart 3.—Treatment of patients with stuttering.

*Medical and Surgical Treatment.*—Emotional instability, tics, choreas, malnutrition, anemia and endocrine disturbances require the requisite medical attention. Speech is not an isolated process. We speak with our whole body, and that which affects the whole affects the part.

Although as already stated, stuttering is a mental affliction, there are physical factors in the vocal tract which may aggravate the condition. These require the services of the rhinolaryngologist, the oral surgeon and the dentist.

*Psychotherapeutic Treatment.*—Stuttering is a spastic coordination neurosis based on a mental conflict. To determine the nature of this mental conflict, which has long since been forgotten and lies buried in the subconscious mind, psychanalysis may be employed. The nature of the conflict is discovered and revealed to the stutterer. The stored-up and suppressed emotions are liberated, and through analysis a readjustment is established.

Suggestion is also useful in creating a spirit of self-confidence, something which the stutterer lacks. A knowledge of mental hygiene is necessary. By positive suggestion the stutterer is convinced that he can speak, that he is cured, that he is well.

Distraction is another form of psychotherapeutic treatment that can be used to advantage. The attention of the stutterer is focused on his speech. This attention can be distracted by various means, such as the metronome, the megaphone, singing, chanting, pacing, writing, elongation of vowels, change of voice and breath grouping.

*Reeducation.*—The reeducational treatment is the only part that can be carried on by the teacher, but this teacher must be especially trained in physical training, vocal gymnastics, the anatomy and physiology of speech and the physiology of respiration. I classify this part of the treatment under these headings: (1) relaxation, (2) breathing, (3) vocal gymnastics and (4) phonetics.

*Relaxation.*—When the stutterer begins to speak, he directs his attention to the process and becomes tense. The muscles contract, he stands rigid, the abdominal wall hardens like a board, the jaw is held tight, the lips are firmly compressed, the fists are clenched, the muscles of the cheek are taut, and there is a spasm of the laryngeal muscles. Against this barrier of spasticity he throws a flow of speech which comes out in a torrent of explosive utterances. Failure aggravates the situation, and he may become speechless.

The first task is to break down the wall of spasticity and liberate the imprisoned voice. The muscles must be relaxed. To attempt reeducation in schoolrooms in which the children are told to sit at attention with their hands behind their backs or clenched tightly in a stiff position on the desk or lap, is an absurdity and is productive of disaster.

Whether in the classroom or in the private office, efforts should be directed toward making the subject forget his existence. The best way to make the stutterer lose self-consciousness is to distract his attention. This can readily be done by the use of exercises in systemic relaxation.

*Breathing.*—Stutterers may or may not breathe properly, and defective breathing engenders stuttering, but the fact remains that stuttering nearly always causes wrong habits of breathing during speech. Most stutterers are clavicular breathers. There are spasmodic closures of the glottis. There are attempts to speak with the ingoing air instead of on the exhalation. The chest may be heaved and pressed down, the action of the diaphragm may be upward instead of downward, and the mouth passage may be obstructed by the position of the tongue. Not infrequently, the breath is taken in quick, hurried, "nervous" gasps. Other subjects take a full breath and then hold it, compressing it so tightly as to make it appear that they would explode before getting a chance to talk. All this is due to a nervous collapse of the normal breath control. Consequently, instruction in breathing, and breath control are necessary.

*Vocal Gymnastics.*—Though stuttering is a neurosis, it is often associated with improperly functioning articulators. The lips are spastic, the tongue unwieldy, the soft palate stiff and the muscles of the mouth and throat taut. Consequently, a secondary improper articulation or defective phonation is developed on top of the stuttering. Exercises directed to the tongue, lips and soft palate will help to correct this failure.

*Phonetics.*—There is no primary phonetic disorder in stuttering. A stutterer can pronounce all the sounds when he does speak. The trouble lies in the process of speaking and not in the contents of the speech. However, bad habits of speech may be formed, and these require reeducation along phonetic lines. But to expect a cure by phonetic instruction alone, as carried out in the schools, is absurd. It may be dogmatically stated that the use of phonetics alone in the treatment of stuttering is harmful.

## SUMMARY

Stuttering as a medical problem is neglected by the medical profession. It is for the most part dealt with by school teachers or by lay "stammering schools" of the advertising type. Stuttering, however, is a medical entity. It is a spastic coordination neurosis based on a mental conflict.

Speech disorders may be classified under two headings: (1) stuttering and stammering, which are synonymous, and (2) defective phonation.

The etiology of stuttering is threefold: predisposing causes, heredity and a neuropathic taint; exciting causes, mental shock and psychic trauma, and aggravating causes, a pathologic condition in the vocal tract.

Every stutterer should undergo a medical examination consisting of (1) obtaining of the history, and (2) a physical, (3) mental, (4) vocal and (5) phonetic examination.

The treatment is medical, surgical, psychotherapeutic and reeducational. Psychanalysis, suggestion and distraction are forms of psychotherapy employed. The reeducational treatment is directed toward muscular relaxation, proper breathing, vocal gymnastics and the correction of defective phonation.

Stuttering is a medical problem, the treatment of which requires the services of the medical speech specialist aided by the oral surgeon, the rhinolaryngologist, the orthodontist, the psychologist and the trained teacher of speech.

17 West Seventy-First Street.

# OTITIC ABSCESS OF THE BRAIN

## REPORT OF A CASE, WITH SOME CONSIDERATION OF OPERATIVE INDICATIONS OF MASTOID INVOLVEMENTS *

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The outcome in a case of acute otitis media is a matter which every otologist agrees is difficult to prognosticate during the first days of the inflammation. Infections starting with violent manifestations often abate, while in cases of seemingly mild inflammations endocranial complications which necessitate surgical intervention unavoidably develop.

The establishment of a definite indication for surgical intervention and its accomplishment at the earliest possible moment are emphasized by every author who writes on the subject. The key to a successful outcome seems to lie in two factors: a definite indication for operation and judicious management of the pathologic process encountered. With an accurate knowledge of the anatomy, the technic of treatment in otitic abscess of the brain, and with few exceptions (deep-seated infections of the petrous pyramid and labyrinth) the management of other endocranial complications do not present special difficulties.

A proper indication for operation does not necessarily imply an exact diagnosis. Indeed, in most cases of endocranial complications it is impossible to establish the site of the pathologic process before operation. The clinical and laboratory observations on an extradural or subdural abscess, circumscript leptomeningitis, encephalitis or abscess of the brain coincide in many points, while one complication is frequently found associated with others to confuse the clinical picture. Thus, Borries [1] stated that every cerebral abscess produces more or less of a meningitis; sometimes it is so slight that it is revealed only by the microscope at autopsy.

To await the appearance of cardinal symptoms usually means the loss of the most propitious time for intervention. One cannot stress sufficiently the importance of a careful history in every case that is not seen from the onset. A chronic otorrhea, latent for years and apparently unworthy of notice, merely accompanied by seemingly insignificant sensations, for instance by slight giddiness on stooping the first time during the morning, is by no means an innocent affair. If an acute exacerbation occurs, all doubt is removed as to the origin of the serious danger.

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* Submitted for publication, Sept. 16, 1929.

1. Borries, G. V.: The Diagnosis of Cerebral and Subdural Abscess by Lumbal Puncture, Ann. d. mal. de l'oreille, du larynx **47**:452 (May) 1928.

Even though the condition of the middle ear is seemingly of no importance, it may mask a serious underlying condition. Endocranial complications frequently arise without serious inflammatory conditions of the middle ear and mastoid process, without producing any visible lesion of the structures surrounding the ear.[2] Bárány[3] warned that there may be a destructive process in the mastoid from an otitis media that has never even required paracentesis of the tympanum.

While the clinical symptoms are valuable, those not evident may be less so, for example a fully developed temporosphenoidal abscess may occurr without any rise in temperature.

Considering acute inflammations of the middle ear with a view to operation, it must be recalled that every inflammation spreads as a collateral edema in a greater or less degree to even distant mastoid cells. Therefore, with every virulent otitis there usually coexists a suppurative mastoiditis, which may clear up without any surgical intervention, just as it often does in the middle ear cavity.

Tenderness is regarded as an indication for operation only in the later stages of otitis media. Neumann[4] asserted that the older an otitis the greater the importance of a symptom. Bárány believed that the symptoms of an acute otitis media which call for an immediate operation during the third week do not have this significance during the first week.

The bacteriologic observations and anatomic configuration are important considerations in prognosis. The physician must decide the course quickly when infections with *Streptococcus mucosus* are discovered, as also when the roentgenograms show unfavorable pneumatosis, unevenly distributed, i. e., large cells in the periphery and small ones in the proximity of the antrum.[5]

Conspicuous reduction in hearing may be observed in conditions other than infection with *Streptococcus mucosus*. In one of my cases it was noticeable from the first day and caused me to be on the alert for the performance of an antrotomy.

Results of spinal puncture are often valuable, although opinions differ as to their interpretation. Some consider as pathologic a fluid containing 3 cells per cubic millimeter, while others accept 10 cells per cubic millimeter as minimum. The cerebrospinal fluid is not a true mirror of the changes within the cranium as the cellular and colloidal

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2. Lund, R.: Differential Diagnosis of Otogenous Brain Abscess, Acta otolaryng. **11**:479, 1927.

3. Bárány: München med. Wchnschr., 1920, vol. 67.

4. Neumann, H.: Zur Pathologie und Klinik der akuten Mastoiditis, Ztschr. f. Hals-, Nasen- u. Ohrenh. **20**:155, 1928.

5. Wirth, Erich: Mittelohrentzüntdung von bakteriologischen und anatomischen Einflüssen, Ztschr. f. Hals-, Nasen- u. Ohrenh. **18**:350, 1927-1928.

elements increase with the repetition of the puncture, daily examination thus proving fallacious.[6]

Neumann saw a case of fully developed diffuse purulent meningitis in which the cerebrospinal fluid gave negative results. Yerger [7] came to the conclusion (155 cases of meningitis, 43 cases of sinusitis, 35 brain abscesses, 8 cases of labyrinthitis and 4 cases of extradural abscess) that the spinal fluid is a reliable index of some of the intracranial complications of otorhinogenic origin, a valuable adjunct in diagnosis and of definite value in the prognosis and treatment, but believed that it should not be relied on to the exclusion of other dependable clinical signs. Lund [8] stated that in view of the great variability of the cerebrospinal fluid reliable information is obtainable only through a series of punctures.

The diagnosis based on the roentgenograms must accord with the clinical observation. During the first days of an otitis media the linings of the cells are filled with pus and are swollen, and the roentgenograms show a haziness which in itself cannot be a decisive factor. In unilateral change of the pneumatosis the cloudiness of the eburneous bone may be misleading. No wonder Emerson [9] said that one should rarely consider operation on the basis of the x-ray picture alone. The clinical picture and some one skilled in its interpretation are also necessary. In another article the same author stated that if one relied on the roentgenogram alone, a great many mastoids would be operated on unnecessarily.[10]

If, however, one hesitates because of a negative observation in the x-ray picture, one courts disaster and risks the life of the patient. To emphasize this I shall describe the x-ray observations two days previous to an operation in a case of abscess of the brain presently to be given in detail. The mastoid consisted partly of cancellous bone and partly of large cells. The spongy part was close to the posterior auditory wall and the large cells were in the tip and posterior part of the mastoid, while there was a slight haziness over the spongy part, it was insufficient to indicate disease. Would one not have delayed unnecessarily in waiting for a more positive roentgenogram?

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6. Brunnings, W.: Bemerkungen in Meningitis Frage, Ber. d. Gesellsch. Sachsisch Thuringischer Kehlkopf u. Ohrenärzte **11**:26, 1927.

7. Yerger, C. F.: Cerebrospinal Fluid as Index of Otorhinogenic Intracranial Complications, J. A. M. A. **85**:424 (Aug. 8) 1925.

8. Lund, R.: Diagnosis and Differential Diagnosis of Otogenic Cerebral Abscess, Hospitaltid. **70**:695 (July 28) 1927.

9. Emerson, F. P.: Indications for Opening Mastoid Cortex, Boston M. & S. J. **186**:301 (March 9) 1922.

10. Emerson, F. P.: Roentgen Diagnosis of Mastoid Disease, J. A. M. A. **75**:91 (July 10) 1920.

Another case presenting a perplexing diagnosis was that of a girl who consulted me on account of an excruciating left-sided headache on May 14, 1927. The girl had acute otitis media six weeks previously, was treated in the hospital and was discharged after the condition in the middle ear had cleared up. Although a lusterless, reddened but not bulging drum was visible, and the mastoid process was normal in appearance, the drum was lanced under aseptic conditions. Two days later, pus found its way from distant mastoid cells into the middle ear. The opinion of the roentgenologist four days later was as follows:

The cell walls are still visible in the left mastoid but are rather cloudy. The mastoid tip is increased in density. The mastoids are not symmetrical. The right mastoid shows a very few cells but they appear to be somewhat more clear than the left. The cloudy appearance of the left mastoid cells suggests mastoid involvement without apparent destruction of bone.

An unusually sharp attack of pain was experienced by the patient during the next day. At operation a large sequestrum on the descending part of the sinus sigmoideus was found, while the latter was partly covered with granulation tissue. Large apical cells were found filled with pus, and there was free hyperemic dura behind the antrum, i. e., an extradural and perisinus abscess.

Although a topographic diagnosis is difficult or altogether impossible with the aid of every-day methods, the recognition of an endocranial complication is indispensable in order to evacuate the pus and check the spreading infection before the natural resistance is exhausted.

The pathology which might explain the clinical manifestations is often difficult to interpret in borderline cases. There may be doubt as to a slight alteration or discoloration of the organs; the change in consistence may require an experienced touch; drawing conclusions about a sinus wall or dura often surpass the average technic. To determine the presence of a parietal mural thrombosis, to ascertain the luster of the dura, its pulsation or bulging often causes doubt.

One needs to consider carefully the questions which direct further operative steps after the resection of the mastoid cells, and, if endocranial signs appear, to direct one's course in line with principles illustrated in the following history of a case which came under my observation. It shows how rapidly an acute otitis may produce an abscess of the brain, and that while the patient may be able to overcome a combined paranasal sinus infection, the same type of infection may become almost fatal even when nature provides proper drainage spontaneously.

## REPORT OF CASE

T. H. E., a druggist, aged 32, during June, 1925, suffered a pleural empyema followed by a discharging fistula. On June 2, 1927, he was taken sick with coryza, earache and a frontal headache. On June 9, a special examination revealed a rather narrow left external meatus, and an inflamed, red, swollen, nonbulging drum with an opening in the posterior lower quadrant through which pulsated a

creamy nonfetid pus. The mastoid was normal in contour: the skin was of normal color and consistence, and no objective pain was noted on pressure.

The patient's right ear had been operated on subsequent to an attack of scarlet fever when he was 3 years of age. Behind the right ear was a cavity the size of a penny leading into a dry, epithelized middle ear. No hearing was possible with this ear. The vestibular functions were not tested.

A conspicuous decrease in the hearing in the left ear was striking, the patient being able to differentiate only loud conversation ad concham. Some rise in temperature was present, but had been influenced by the analgesic which he had taken on account of the severe headache.

The nasal cavity showed a pronounced deviation of the septum to the left. Pus drained from both the upper and the middle meatuses, several of the sinuses on both sides apparently being affected, especially the frontal and posterior ethmoids. It was impossible to state how much of the pain could be referred to the sinuses or to the inflamed ear, the poor hearing suggesting a rather serious infection from the beginning. On the following days, the patient suffered with severe headache and his ear and nose drained considerably. After a cocaine-epinephrine spray the sinus condition reacted favorably, showing a definite tendency toward healing, while the condition of the ear remained the same. The creamy discharge was profuse. A severe headache on the same side of the head, especially toward evening, persisted, the patient being able to secure rest only by taking analgesics. The temperature vacillated from 100 to 102 F.

On June 19, the region of the antrum became somewhat sensitive to pressure, without any noticeable objective changes. On June 21, a roentgen examination was made, resulting in the negative observations previously mentioned. On June 22, the patient vomited once in the afternoon, which prompted me to consider an immediate surgical intervention in spite of the negative x-ray observations. By this time the nasal condition had practically cleared up, and there was only a scant mucous discharge from the left frontal sinus. The patient had an attack of vomiting on an empty stomach the next day, a few hours before operation.

On June 23, a mastoidectomy was performed. It revealed a hyperemic, thick cortex, a pneumatic mastoid process, granulations and pus disseminated throughout the cells. The capsule of the sinus was normal, the zygomatic cells were large, and the wide antrum was filled with granulation tissue and pus. On the top of the mastoid process was found a bony fistula communicating with the middle cranial fossa, no pus being present in the extradural space. The fistula and vomiting suggested endocranial involvement and the probable necessity of a second operation within a few days.

On June 24, the patient had a fairly good day; there were no complaints, the cranial nerves were apparently uninjured and the highest temperature was 102 F.

On June 25, a mild headache was present on the left side. The wound was clean. Pus was present in the antrum, but there was no suppuration from the middle scala or from the middle ear. The fundus of the eye was normal. The hearing was poor, conversational sound being heard ad concham.

On June 26, severe headache was noted. The temperature was 103 F., and the patient was restless and at times drowsy. At 7:30 p. m. the patient's sister observed that he was unable to talk or to move his right hand.

On June 27, paralysis of the right arm and leg was observed. Both sides showed positive Oppenheim and Babinski reflexes, a negative Kernig sign and did not show rigidity of the neck. The pupils were even and sluggish to light. Incomplete amnesic and motor aphasia were present. Cerebration was slow. There was

slight oculomotor and facial paresis. The test for nystagmus was negative there were a few excursions of the eyeballs to the left.

As the antrotomy incision did not yield sufficient space for uncovering the dura around the fistula, a conservative radical operation (in view of the deaf right ear) was performed, consisting of the resection of the wall of the posterior meatus almost down to the level of the horizontal semicircular canal without breaking through the bridge. The tegmen antri was removed, and an area of the dura, 2 cm. in diameter, was uncovered. The dura was lusterless with a slight coating of fibrin, through which a crucial incision was made, and the brain was explored in different directions with a needle. About 1.5 cc. of bloody serum was withdrawn, but no pus; this was interpreted as indicating encephalitis hemorrhagica. The cerebrospinal fluid was under moderate pressure, and contained 3 cells per cubic millimeter, the globulin and sugar reactions being negative.

On June 28, the patient felt restless and drowsy. The Kernig sign was positive. Coarse movements of the eyeballs were noted; tests for hearing gave positive results. The dressing was changed and the edges of the dura were found to be retracted; the arachnoid was pinkish and was pulsating. When the brain was touched, epileptiform contractions appeared over the body. The left optic fundus was normal; the temporal contour of the right papilla was somewhat hazy. Constipation, probably spastic, was noted. The pulse rate was 92, and the pulse was regular and strong.

Dr. J. Gordon saw the patient and suggested repeated trial punctures of the abscess within a few days.

From June 29 to July 1 the condition remained unchanged. Dressings were made daily.

On July 2, pus was observed oozing from the brain; an incision was made and loose iodoform packing was placed in the abscess cavity.

On the following day considerable pus was present in the brain. The abscess opening was patulous and the abscess walls were well visible and pulsating, the abscess being about the size of a walnut with septums through the cavity. The patient was smiling, observant, answered yes or no, and muttered a few unintelligible words.

On July 4, there was considerable brain prolapse, almost filling the wound. The abscess cavity was irrigated with hydrogen peroxide solution. The patient read a newspaper.

On July 5, there was livid granulation tissue in the mastoid wound, the abscess walls were pulsating, and there was scant seropurulent discharge on the drain. The drum was pinkish; some pus was present in the middle ear. The left papilla was hazy.

From July 6 to 14, gradual improvement was noted, paralysis diminishing. The patient moved the arms and legs and tried to talk. The wound was granulating, and the brain prolapse was retracting.

On July 15, the abscess opening was nearly closed there was no pus from the brain and the middle ear was dry.

On July 17, the drain in the abscess was discontinued.

On July 18, the patient was apathetic; the temperature was 100.8 F. He complained of headache and vomited once. As retention was suspected, the abscess was reopened, but no pus was found. The iodoform gauze drain was soaked through in a few minutes with clear serum from the subarachnoid space. Lumbar puncture showed a clear fluid under high pressure, with a cell count of 49, traces of globulin, no micro-organisms, and a negative sugar reaction. After spinal puncture, the patient visibly improved.

On July 19, there was blood from the abscess with appearance of serum later. The neck was free from involvement; the eye movements were normal; tests for hearing gave positive results, and test for nystagmus was negative. The patient tried to talk and understood everything said to him. He seemed to be suffering, but said that he did not have headache. The Kernig and the Oppenheim signs were negative; the Babinski sign was positive on the left side.

On July 20, considerable prolapse of the brain was still present. The wound appeared more livid; there was no pus from the abscess, but some blood. The drum was grayish. The patient heard whispering. The right papilla showed signs of papillitis; the left papilla was normal. Methenamine (2.5 Gm.) was given intravenously.

On July 21, no indication of brain pressure was noted. Methenamine (2.5 Gm.) was given intravenously.

On July 22, the brain prolapse was moderate. The wound was granulating. The abscess was closed. Methenamine (2.5 Gm.) was given intravenously.

On July 25, the wound was small. There was slight brain prolapse and good hearing. Methenamine (2.5 Gm.) was given intravenously.

On July 27, the wound was growing smaller and speech was improving. On July 29, no brain prolapse was noted. The wound was granulating. On July 31, the patient sat up for half an hour. On August 4, he was discharged from the hospital.

Recovery was uneventful. On October 1, the patient was free from objective and subjective symptoms, with no sign of the paresis nor of the aphasia.

In this case a temporosphenoid abscess of the brain became manifest on the twenty-fourth day after the onset of a streptococcic otitis media. Whether the organism was *Streptococcus hemolyticus* or another variety of streptococcus was not stated in the different bacteriologic reports.

No doubt the lowered bodily resistance resulting from the pleural empyema and the unfavorable mastoid structure, played important rôles in the development of the endocranial condition. I believe that the fortunate outcome was a result of prompt intervention in line with the principles mentioned in an earlier part of this paper.

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# DRY NECROSIS OF THE MASTOID

## A REPORT OF FOUR CASES *

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The cases here reported represent a peculiar form of mastoiditis characterized by an infection of long duration, few symptoms and an extensive dry necrosis. Cultures from cases 1, 2 and 4 were negative. In case 3 the laboratory report was: The gram-stained smear shows short streptococci and diphtheroid bacilli; the culture shows gram-negative spored bacilli. It is possible that all of the cases were of *Streptococcus mucosus* origin as this organism may cause extensive involvement of the bone in the mastoid, with but few symptoms; further, the tympanic involvement may be transient. In case 1 of this report and in certain other cases reviewed, the drum membranes were intact and free from all signs of disease, while in the mastoid a most extensive necrosis was present. Prior to encountering these cases, we were unaware that an extensive necrosis of the mastoid could exist for many years with extremely mild symptoms or none, and in the presence of a normal tympanum.

In every case of otitis media there is an involvement of the mucosa of the mastoid cells. The reddened and swollen mucosa, the round cell and leukocytic infiltration, the discharge, which is too copious to have originated in the tympanum alone, form the mastoid pathologic sequence with which we are all familiar. When drainage from all mastoid cells is unobstructed and the usual myringotomy has been performed, or when the tube is large and patent, it is probable that resolution of the pathologic process in the mastoid occurs without a macroscopic trace of the disease remaining. If for one reason or another the acute process in the tympanum becomes subacute and finally chronic, or if the aditus ad antrum becomes obstructed, many different conditions can occur in the mastoid.

In otitis media purulenta chronica, one usually anticipates a more or less completely sclerosed mastoid with necrosis in varying degrees about the antrum. When the process has existed for a long while and a marginal perforation has developed, through which epidermis from the external canal may wander into the tympanum and thence to the

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* Read before the St. Louis Ear, Nose and Throat Club, Jan. 16, 1929.

mastoid antrum, there may gradually occur a progressive bone necrosis from pressure and infection, until at the time of operation one finds a large cavity filled with cholesteatomatous and other material. In still other cases there is an extensive antral necrosis, without cholesteatoma, but with pus and granulations. The dura of the posterior and middle fossae may be exposed and covered with granulation tissue.

In the cases here reported, none of these conditions occurred. There was no evidence of osteoblastic activity, no sign of cholesteatoma except in the tympanum in case 2, and no secretion in any of the three cases.

Primary mastoiditis of blood stream origin doubtless exists, but rarely. More commonly, the so-called primary mastoiditis, has resulted from a fleeting tympanic infection that has passed into the mastoid cells and become shut in by an obstructed aditus ad antrum. The tympanum fully recovers from infection and presents a normal external wall at an examination months or years later. The inflammatory process in the mastoid may proceed in different ways. If the virulence of the organism is sufficiently great and if the mastoid shell is not sufficiently resistant, and the body reacts with a large number of leukocytes and enough fluid, external redness and swelling and perforation of the cortex may occur at an early date. If the bacteria are of low virulence, the exudate not profuse and the mastoid shell strong, the pathologic process may go on unnoticed for months or years. The mastoid structures break down, the exudate is absorbed, the bacteria succumb and finally there results a dry necrosis of the mastoid with the extreme end-result of an empty shell (as in case 1). Probably much of the late necrosis results from lack of blood supply.

C. J. Swan [1] reported the case of a man, aged 58, who had had pain in the left ear and the left side of the head for three weeks prior to examination. A mastoid operation had been performed on the right side several years previously, and hearing on that side was normal. Hearing on the left side was markedly impaired. The left drum membrane was red but not bulging. The mastoid was of normal appearance, with a slight tenderness to deep pressure. The temperature was 103.6 F. Myringotomy released only one drop of fluid. Three hours after the examination, the patient was comatose, with unequal pupils, slight nystagmus, positive Babinski sign, rigidity of the neck and a moderate discharge from the ear. The spinal fluid was turbid. The mastoid operation revealed the following: There was no thickening of the skin or subcutaneous tissue; the periosteum peeled off easily; the mastoid cortex was livid; the cells were of a bluish lead color (as in case 3) and devoid of mucosa, and contained a few granulations;

1. Swan, C. J.: Report of Four Cases of Mastoiditis Where Operation Was Too Long Delayed, Ann. Otol. Rhin. & Laryng. **34**:869 (Sept.) 1925.

there was a little pus in the antrum. Swan described the condition as "a sort of dry necrotic process, never before or since observed by the writer." Type III pneumococcus was recovered from the mastoid and from the spinal fluid. The patient died two days later of leptomeningitis. Swan concluded: "The observations in the mastoid and in the spinal fluid proved conclusively that he died of otitic leptomeningitis and his life could in all probability have been saved by an early operation."

No comment is made on what we believe to be a significant fact; namely, that the necrosis involving the entire mastoid and reaching the intracranial cavity was not an acute process, a process which could plausibly have developed in the three weeks' period noted in the history. The patient had had a mastoid operation performed on the right side several years previously; possibly the mastoiditis of the left side dated from an otitis which accompanied the otitis of the right side at that time.

Oscar Wilkinson [2] reported a case of what he called dry necrosis of the mastoid cells.

A woman, aged 25, complained of severe headaches, and pain behind the eyes, in and behind the right ear and in the occiput. In order to eliminate the eyes as a causative factor, an error in refraction was first corrected. This relieved the pain in the occiput and the frontal headache. The pain in the right ear and mastoid continued; it became so severe that the patient could not sleep. There was nausea and vomiting. The drum membrane showed scars, and there was a history of repeated suppuration of the middle ear between the ages of 8 and 15, but none for the past ten years. The postauricular pain had occurred on several occasions and had lasted from a month to six weeks. For twelve months prior to examination, there had been pain and sensitiveness in the mastoid region. The temperature ranged from 98.6 to 100 F. daily for two weeks before operation. The author said: "I operated with some degree of hesitancy, owing to the fact that the pain and tenderness on pressure and enlargement of a few superficial lymphatic glands were the only signs of inflammation of the mastoid. I expected to find sclerosis of the mastoid tip with an associated neuralgic condition, with the possibility of pus in one of the cells. On opening the mastoid, the external layer of the bone was found to be more brittle than the normal; there was an entire absence of oozing from the bone. I found the cells dry and friable, apparently as dry as those of a skeleton and much more friable. Not a drop of blood was found from the first chiseling of the first layer of bone until the aditus ad antrum was reached. There was no pus in any of the cells. Recovery was uneventful, the symptoms entirely disappearing after the operation."

Here again is a history of previous suppuration with pain and tenderness of the mastoid continuing for years after all evidence of suppuration of the middle ear had disappeared.

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2. Wilkinson, Oscar: A Case of Dry Necrosis of the Mastoid, M. Rec., June 2, 1912, p. 1188.

Phinizy Calhoun's [3] 400 mastoid operations did not include a case of dry necrosis or a case of mastoiditis with a normal drum membrane. This author emphasized the importance of *Streptococcus capsulatus* in aural infections; he stated that infections from this organism are slow and treacherous. The streptococcus and pneumococcus were responsible for 385 of the 400 cases. This large series is mentioned to show the infrequency of dry necrosis.

Levi Jay Hammond,[4] in presenting the records of 183 mastoid operations, did not mention a case of dry necrosis.

In E. J. Moure's [5] tabulation of 500 cases of mastoiditis with operation, mention was made of 1 case of extensive necrosis and facial paralysis, 1 of mastoid necrosis with symptoms of meningitis, 1 of pneumatic mastoid with necrosis of the cortex, 1 of diffuse osteitis with necrosis, 1 with necrosis extending from the outer cortex to the sinus, 1 with a large cavity in the mastoid and necrosis extending to the antrum, and 1 of necrosis involving the labyrinth and presenting an exposed facial nerve with paralysis. Unfortunately, none of the cases of Moure were described in sufficient detail for one to determine whether the necrosis was a dry necrosis or the usual type. However, as the presence of cholesteatomatous material, granulations or pus is mentioned in his other cases, it is possible that these 7 cases were cases of dry necrosis, although the occurrence of so unusual a condition would probably have evoked a lengthy and accurate description.

B. E. Hempstead [6] reported "six cases of definite mastoiditis in which the middle ear was definitely not affected. In case 1 of his series, a man, aged 20, gave a history of ear trouble starting seven years previously. The last attack was five weeks prior to examination. The hearing was normal. Both drum membranes were normal. At operation, a perforation of the tip was found. The aditus ad antrum was very small. An abscess cavity was drained and all cells removed. The culture showed staphylococcus. In case 2, a boy, aged 14, had had influenza two months before examination. Hearing was normal. Catheterization of the affected side showed the tympanum to be clear. There was redness and swelling of the tip. Perforation of the cortex, marked destruction of cells and perisinus abscess were found. Cul-

3. Calhoun, Phinizy: Results in 400 Operative Cases of Mastoiditis, New York M. J., Feb. 13, 1909.

4. Hammond, Levi Jay: Case Book Record of 183 Operations on the Mastoid Bone, Philadelphia M. J., Jan. 31, 1903, p. 221.

5. Moure, E. J.: Relevé statistique 500 interventions faites sur l'apophyse mastoïde: Communication faite au VII Congrès International d'otologie de Bordeaux, Supplément à la Rev. hebd. de laryngol, August, 1904.

6. Hempstead, B. E.: Six Cases of Definite Mastoiditis in Which the Middle Ear was Definitely not Affected, Ann. Otol. Rhin. & Laryng. **35**:517 (June) 1926.

ture showed streptococcus. In case 3, a man, aged 41, gave a history of influenza four months prior to examination. During the attack of influenza there was pain in the left ear followed by a bloody discharge. At the end of two weeks, there was slight tenderness over the mastoid, which disappeared in a few days. The patient was apparently well until two weeks before the examination when he developed a cold followed by tenderness and swelling of the left mastoid. Hearing was normal. The drum membranes were normal. A large subperiosteal abscess and perforation of the cortex were found. All the cells were broken down and filled with pus and granulation tissue. In case 4, a woman, aged 75, came to the clinic with pain and redness over the right mastoid. There was no history of ear trouble until after an attack of influenza the previous winter. The hearing was normal, and both drum membranes were normal. At operation, a subperiosteal abscess was found. The aditus had been completely walled off. The sinus was exposed. Culture showed *Streptococcus mucosus* or type III pneumococcus. In case 5, a man, aged 62, complained of pain in the left mastoid region. About three months previously he had had influenza with bilateral otalgia. Two days after the onset, the right drum membrane ruptured. One week later, the left drum membrane ruptured. The patient was not deaf; there was no perforation of either drum membrane at the time of the examination. The left drum membrane was normal. There was pain and tenderness of the left mastoid. Operation revealed a perforation of the tip. The sinus was exposed. Culture showed type III pneumococcus. In case 6 of the series, a man, aged 21, had pain and swelling in the left mastoid region. Four months previously he had a severe cold with bilateral otalgia. Both membranes had been incised and there was a discharge of pus for four or five days. Three months later, the patient had a slight otalgia of the left side. The hearing and drum membranes were normal at examination. At operation, a large subperiosteal abscess with rupture of the cortex was found. Cell partitions had broken down. Pachymeningitis in the region of Trautman's triangle and a perisinus abscess were found. Culture showed a small gram-negative bacillus.

In his summary, Hempstead stated that in all his cases the structures of the tympanum were normal on physical examination; that the study of the cases of mastoiditis without apparent involvement of the middle ear indicates the existence of an antecedent otitis media; that the roentgen examination is important; that the predominance of *Streptococcus mucosus* in these cases warns us of the danger in this type of infection and puts us on guard when the organism is found in the acutely discharging ear.

Hempstead's cases were not cases of dry necrosis, but are quoted because they seem to represent an early stage of dry necrosis. If the

virulence of the invading organism is great and excessive exudation occurs, cortical rupture or intracranial complication may occur and demand operation before the condition can be transformed into one of dry necrosis.

Hempstead collected a number of similar cases in the literature, which may be briefly mentioned with the names of the original reporters.

F. H. Knight [7] reported the case of a young girl who, three months after a two weeks' attack of influenza, developed a swelling over the mastoid and was operated on, the operation revealing extensive destruction of cells.

W. S. Tomlin [8] had a patient who had been an invalid for ten years prior to examination. Because of slight pain back of the ear, the mastoid was opened, and chronic suppurative granulomatous infiltration with thin, dark fluid was found. The patient recovered and in a short time gained 20 pounds (9.7 Kg.).

T. E. Hughes [9] described a case showing pain in the right ear and definite swelling over the mastoid. There was a slight discharge for several weeks, and then a gradual "recovery" without operation. Eighteen months later the patient developed pain and swelling of the mastoid. An operation revealed a definite mastoiditis.

J. M. Brown [10] reported the case of a young woman who in July, 1923, went swimming in a plunge, and developed a cold with intense pain in the right ear and a temperature of 101 F. Pain continued for one week with no evidence, in the drum membrane, of tympanic trouble. It lasted until August 6. On September 15, she began to have headaches. On October 6, she went to bed with a chill and a temperature of 103 F. Blood was discharged through the external canal wall. The drum membrane remained normal. At operation, the sinus was found exposed and the middle ear sealed off.

Arhur M. Alden,[11] in a personal communication, reported a case of dry necrosis of the mastoid in a school boy, aged 11, who was seen because of a chronically discharging right ear following measles at the age of 1 year. Examination showed a profuse, foul smelling discharge which, on smear and culture, showed staphylococci and saprophytic organisms. There was a large posterior perforation through which

7. Knight, F. H.: Case of Perisinus Abscess Without Involvement of the Middle Ear, Laryngoscope **29**:433, 1919, quoted by Hempstead (footnote 6).

8. Tomlin, W. S.: Report of a Case of Suppurative Mastoiditis Without Tympanitis, Indianapolis M. J. **30**:95, 1916, quoted by Hempstead (footnote 6).

9. Hughes, T. E.: An Unusual Case of Mastoiditis: Operation and Recovery, Virginia M. Monthly **49**:726, 1923, quoted by Hempstead (footnote 6).

10. Brown, J. M.: Atypical Mastoiditis: Case Report, Laryngoscope **34**:644, 1924, quoted by Hempstead (footnote 6).

11. Alden, Arthur M.: Personal communication to the authors.

the lower edge of a large red granulation could be seen. Treatment produced no change in the condition. Roentgenograms showed chronic mastoiditis on this side.

Under gas anesthesia, a typical simple mastoid exposure was made. The cortex covering the mastoid was thick and normal in color. When this was removed, the mastoid cells, which were of the diploetic type throughout, were entirely dry and dark brown, and gave one the impression of dead bone. This bone cut easily with a curet. It was necessary to clean out the mastoid completely before normal bone was reached. The aditus was entirely closed off by a bony growth and was not opened. There was no moisture in the mastoid from which a culture might be taken but a swab rubbed over some of the material removed showed "no growth."

The child made an uneventful convalescence from the operation, but it was necessary to do an ossiculectomy and a partial annulectomy before a result was obtained.

## CASE REPORTS

CASE 1.—On Feb. 14, 1918, a man walked into our office, accompanied by his son, aged 18. The father looked depressed as if from anxiety of long standing. He volunteered the following information: "Doctor, my son is peculiar and has peculiar things. I'm terribly worried about him." He then told that an appendectomy had been performed on his son one year previously and that shortly after, and in another city, the physicians found it necessary to reopen the abdomen and remove some enlarged glands. Abdominal distress continuing, a third operation was performed and some adhesions were separated. The patient then seemed fairly well up to three weeks before presentation when a mastoid was performed on the right side. The tonsils had been removed on Sept. 1, 1917. There was a history of pneumonia, typhoid fever and pertussis.

The complaint at the time of the examination was pain in both ears, though more in the right ear. Examination revealed a normal right drum membrane, except for a slight injection, and a normal left membrane. The right mastoid showed a scar and marked tenderness on pressure over the antrum, tip and emissary. Slight tenderness existed on pressure over the left mastoid. The whispered voice was not audible in the right ear but was heard in the left at a distance of 40 feet (12 meters). With the noise apparatus on the left, a loud voice was heard with the right ear. Weber test showed lateralization to the left. With Rinne's test, hearing on the right side was not satisfactorily determined. On the left side positive results were obtained; the $C^1$ fork was heard on the left but not on the right side, and the $C^4$ fork was heard normally on the left and not at all on the right side. The mouth was normal. The tonsils had been removed. The oropharynx was normal. There were adenoid vegetations in the epipharynx. The nose showed subacute rhinitis, deviation of the septum to the left and hypertrophy of the posterior end of the left inferior turbinate. The paranasal sinuses were normal.

The condition puzzled us. The markedly reduced hearing on the right side, with the lateralization to the better hearing ear in Weber's test, pointed to nerve deafness. The mastoid tenderness on the right we attributed to the recent operation; that on the left we were entirely unable to understand in view of a

normal drum membrane and hearing at 40 feet. After observation during several visits the opinion was given that the boy was exaggerating the usual discomfort that is felt after any operation. We felt safe in disregarding the slight tenderness on the left side. The father was advised to take the boy home and keep him occupied. To this the father answered "You don't understand my boy. He has peculiar things. I'm sure he has trouble in both his mastoids and I want them opened." We did our best to convince him that as a layman he was not in a position to say when a mastoid was or was not to be operated on. Father and son left the office unimpressed by our words, and the next day they returned. The tenderness was still present. The patient had developed a slight swelling over the left mastoid. Vertical nystagmus upward was noted. The boy was placed in the hospital for observation. The white count was normal, and roentgen examination showed absence of cell outline on the right and left sides. The temperature was 99 F. A general examination by the internist was negative. An exploration of the mastoids was finally decided on.

Under ether anesthesia, an incision was made through the scar over the right mastoid. It was promptly discovered that the former "mastoid" operation had consisted of nothing more than a simple incision through the skin and periosteum with the removal of a small amount of bone. The cortex of the mastoid was dark. With a few strokes of the chisel this was removed and under it was revealed an empty shell. The mastoid contained no granulations nor a drop of secretion. The cavity was lined with a grayish-green, dry membrane. The dura of the posterior and middle fossae was exposed in the removal of a thin layer of necrotic bone. The wound was closed in a double layer with catgut, and rubber tube drainage instituted. The drum membrane was not incised. The left mastoid was then exposed. To our astonishment the same discolored bone was found; after removing the cortex another dry, empty mastoid was brought to view. There was no blood except from the skin incision, no pus, and no granulations. The wound was closed as on the right side. Cultures from both sides were negative. Twenty-one days after the operation, both drum membranes were found bulging. A double myringotomy was performed. Thirty-three days after the operation on the mastoid, the right ear was well. Two days later, the left ear was well. The vertical nystagmus disappeared a few days after the operation. Thirty-eight days after the operation, the whispered voice was heard normally on the right side (at 40 feet), and at 15 feet (4.5 meters) on the left. Soon after, hearing on the left side became normal. Forty days after the operation, the patient was sent home well. Eighteen days later, the patient returned with an acute sinusitis and discharge from the right ear. The next day, a myringotomy had to be performed on the left side. In fifteen days, the ears were dry and soon after, the hearing had again returned to normal.

Several months later, we were greatly surprised to hear that the patient, having developed further trouble with his ears, had consulted a colleague in our city. This physician telephoned our office for information concerning the patient's former trouble, but proffered no information as to the condition at the time. About a year later, the patient died from some undiagnosed abdominal condition.

CASE 2.—A woman, aged 23, examined on Feb. 10, 1923, complained of a cold which had persisted for six months. In addition to nasal discharge, there was stuffiness of both ears. The previous history showed that the left ear was burned with hot coals in childhood. She had had typhoid fever at the age of 8, measles and whooping cough.

Examination revealed: a normal mouth, chronic tonsillitis (pus on the left side), lymphoid tissue in Rosenmueller's fossae, and a normal oropharynx, hypopharynx

and larynx. The nose showed deviation of the septum and chronic sinusitis. The right drum membrane was normal; the left showed retraction and a scar. The Rinne test yielded a positive reaction on the right side, and a negative reaction on the left. Weber's test showed lateralization to the left. The $C^1$ fork was heard on both sides; hearing for the $C^4$ fork was normal on the right side, but impaired on the left. The whispered voice was heard at 40 feet on the right side, and at 25 feet (7.6 meters) on the left. The patient refused a tonsillectomy and removal of lymphoid tissue from the vault.

On March 10, 1925, the patient returned with an otitis media purulenta acuta on the left side. In three days, the ear was dry. On August 3, she returned with the history of a reinfection of the left ear two weeks previously. There was a large perforation through which protruded a white mass that was apparently cholesteatomatous. A roentgenogram of the mastoids showed blurring and bone destruction on the left side. The temperature was 99.6 F. The $C^1$ fork was not heard on the left side. Perception of the whispered voice had dropped to 8 feet (2.4 meters) on the left side. There was tenderness over the posterior surface of the tip of the left mastoid. The posterior wall of the left canal was extremely tender to probing. On August 12, the tenderness was more marked on pressure over the tip of the left mastoid.

An operation was performed on August 12. When the outer plate of the mastoid was removed, a mass of dry, gray bone was uncovered. Nowhere was there a sign of cholesteatomatous material, pus or granulations. Large empty cavities were found in the mastoid. The dura of the middle and posterior fossae had to be exposed. A modified radical operation was performed. The posterior wall including the bridge was removed, but the ossicles, drum membrane and membranous external canal were left intact. The wound was closed in two layers with catgut; rubber tube was inserted for drainage. Culture from the mastoid showed no growth. On August 28, the whispered voice was heard on the left at 5 feet (1.5 meters), and on September 14, at 9 feet (2.7 meters). On September 21, it was noted that the perforation was closing and that there was no sign of cholesteatomatous material in the tympanum. On September 26, the whispered voice was heard at 18 feet (5.5 meters) on the left side, and on October 23, at 12 feet (3.6 meters); the drum membrane was perfectly healed.

This case is interesting because of the regeneration of the drum membrane, the dry necrosis and the absence of cholesteatoma of the mastoid in the presence of an apparent cholesteatoma of the tympanum.

The apparent cholesteatoma of the tympanum, unrelated to the extensive dry necrosis of the mastoid, is a most unusual observation, for otitis media purulenta chronica commonly shows the following pathologic sequence: Complicating the chronic inflammation of the tympanic mucosa is a similar condition of the lining membrane of the mastoid cells. The round cell infiltration slowly results in the formation of new connective tissue. Ulceration with granulation tissue formation helps to fill the air spaces. Finally, the newly formed tissue is invaded by osteoblasts which complete nature's effort at obliteration of a chronically inflamed region. For some unknown reason, the antrum remains a cavity but the aditus may be narrowed or closed. If epidermis wanders in from the canal through a marginal perforation,

the process will usually extend into the mastoid and in other directions. As the epidermal growth extends into the antrum it meets the solid sclerotic bone of the mastoid, and after many months or years may undo the work so carefully carried out by nature for the protection of the person, by breaking down the new-formed bone. We are familiar with the theory that the sclerosed mastoid exists prior to the tympanic suppuration. This may occur, but probably the former conditions are of much more frequent occurrence.

In the present case the cholesteatoma was a recent condition, while the extensive dry necrosis had probably existed for many years, possibly dating back to the otitis following the burn which occurred some twenty years previously. This is, of course, mere speculation. It is certain, however, that the mastoid necrosis coexisted with a perfectly intact drum membrane such as was observed five months prior to the operation; for in the interim, and up to two weeks prior to operation, there had been no otitis, the ear was dry and the drum membrane was intact.

When a patient was treated for a chronic condition of the ear, and finally a perfect healing of the drum membrane was accomplished, we heretofore took for granted that everything posterior to the membrane was normal. We know differently now. A drum membrane may be intact and free from every evidence of inflammation, the hearing may be good, yet an extensive pathologic condition may be stealthily progressing in the mastoid process.

In a personal communication, Dr. C. Armin Gundelach [12] reported a case of extensive mastoid necrosis in a man whose drum membrane was normal two weeks previously. In this case the condition must have been in existence for at least many months and probably years. Because of the patient's complaints the ear was looked at repeatedly; the drum membrane was found to be normal each time. One day a necrosis of the posterior wall was noted, and soon thereafter a large sequester was removed. A probe could then be passed in all directions from the antrum to the tip. After the sequester had been removed, the drum membrane began to show thickening and slight bulging and had to be incised. The case was not one of syphilis or of tuberculosis. This patient gave the history of several attacks of suppurative otitis media. Doubtless with each attack there had occurred an exacerbation of the mastoiditis and an extension of the necrosis. Finally the process involved the posterior wall sufficiently to break through. Our case 1 is similar to Dr. Gundelach's in that both patients had normal drum membranes and both showed extensive mastoid necrosis. In our case there had occurred a complete breaking down and absorption, whereas in

12. Gundelach, C. Armin: Personal communication to the authors.

Dr. Gundelach's case, the posterior wall was encroached on and necrosis had broken through it before complete absorption could occur.

CASE 3.—In a boy, aged 3, who was first seen Oct. 4, 1921, the complaint was a discharging ear since an attack of scarlet fever at 1 year of age. At times the patient would apparently recover only to have the condition start afresh with each new cold.

Whooping cough occurred at 2 years, followed by a prolonged attack of bronchitis. Recently the patient had suffered greatly from attacks of urticaria.

Examination revealed a chronic tonsillitis with bilateral anterior cervical adenitis, a small adenoid, a normal right drum membrane, a large central perforation of the left drum membrane and a purulent discharge. The whispered voice was heard at 40 feet, on the right side and at 5 feet on the left.

On Oct. 5, 1921, a tonsillectomy and an adenoidectomy were performed under gas anesthesia. On October 10, the ear was dry and the patient was discharged.

On Sept. 1, 1925, the patient returned. The ear had started to discharge soon after he reached home (Mankato, Minn.) and had continued to discharge at intervals since that time. The discharge had become fetid. For several weeks the patient had been unable to whistle. A facial paresis existed. The left drum membrane now showed a marginal perforation.

On Sept. 8, 1925, a radical operation was performed on the mastoid. As soon as the periosteum had been elevated, the entire mastoid was seen to be extremely dark. Extensive necrosis was encountered. The dura of the middle and posterior fossae, was exposed. There were large cavities in the necrotic bone, some of them extending alarmingly into the facial spur.

Nowhere was there pus, granulations, cholesteatoma or any sign of moisture, except for the small amount of blood which oozed into the cavity from the skin incision. The bone was dry and brittle. Even the antrum was dry. Sections of bone from the mastoid showed no inflammatory exudate.

A gram-stained smear made with the blood which trickled down from the skin incision showed diphtheroid bacilli and short streptococci. A culture showed gram-negative spored bacilli.

One week after the operation, the facial paresis showed a marked improvement; the patient could again whistle. Finally the condition cleared up completely. Healing took place rather more rapidly than usual, except for the tube which has never closed. On the anterior surface of the facial spur there is also a rather deep and narrow cavity. Several small sequesters have been thrown off from this cavity.

The marginal perforation and fetid discharge would ordinarily lead one to expect a wet mastoid or at least a wet necrosis of the antrum, with sclerosis of the remainder of the mastoid, if sufficient time had elapsed for such a constructive bone process to have taken place. In this case the fetid discharge originated in the tympanum and tube alone, as the entire mastoid region was dry. That the chronic mastoiditis was a direct extension from the otitis media there is no reason to doubt, but why there should have occurred a dividing of the ways—the mastoid becoming dry and the tympanum continuing wet—we do not know. The aditus ad antrum was not obstructed. At the age of 1 year, when the child developed an otitis from scarlet fever, there

must have occurred a widespread involvement of the mastoid. As is common in scarlet fever, there probably ensued a necrosis of the lining membrane of the mastoid cells. This mucosa failed to regenerate. The denuded bone of the mastoid underwent necrosis and the process became more and more extensive. When the patient was first seen in 1921 and the tonsillectomy and adenoidectomy were performed, the mastoiditis was most probably in existence. Unfortunately, no roentgenogram was made at the time. The fact that five days after the tonsillectomy and adenoidectomy the ear became dry is of extreme interest in view of what was probably transpiring in the mastoid. The urticaria has never recurred since the mastoid exenteration was performed.

The involvement of the orbicularis oris or buccal-supramaxillary nerve presented a most peculiar and unexplained symptom. Just prior to the development of the facial paresis an acute and severe gastro-intestinal disturbance occurred, with marked elevation of temperature. The facial involvement was thought to be a toxic neuritis by the physician in charge. On the patient's arrival in St. Louis, we held a consultation with Dr. Harry Lyman. He considered the facial paresis a neuritis resulting from the gastro-intestinal disturbance and not a complication of the condition in the ear. His opinion was based on the fact that only the orbicularis oris was involved. We were inclined to believe that the paresis was a complication of the disease of the ear. We all agreed that the prolonged suppuration, fetid odor, marginal perforation and markedly reduced hearing gave sufficient indication for an operation. The extension of necrosis into the facial spur and the marked improvement in the paresis within a few days after operation, with ultimate complete disappearance of the paresis, left little doubt concerning the chief etiologic factor in connection with the involvement of the seventh nerve. Concerning the selective effect on the buccal-supramaxillary division of the facial nerve, we have no explanation to offer. The neural condition was probably a perineural edema. There is no reason to believe that a central lesion existed.

CASE 4.—A woman, aged 23 years, was operated on, on June 14, 1926. She had had purulent otitis media of the right ear in childhood but had recovered without complications. Since then she had had occasional attacks of stuffiness in the right ear, with reduced hearing during the attack. The patient was first seen in August, 1925, while convalescing from an appendectomy. At that time, she complained of a sensation of fulness in the right ear, with mild tinnitus. The drum membrane showed no acute change but a scar and retraction. Inflation gave relief. This was repeated once or twice during the convalescence. Again in January, 1926, the patient complained of discomfort about the right ear, with slight pain around the tip of the mastoid and in the cervical region inferior to the tip. She felt that some pressure existed in the external canal. Examination of the drum membrane disclosed no change from the previous observation. There

was, however, a slight fulness in the posterior superior canal wall, and definite tenderness in that region. No tenderness was noted in the region of the mastoid, and the roentgenogram showed an absence of cell outline and general cloudiness of the mastoid. The patient was kept under observation. There was no improvement in the canal walls. Tinnitus was present only occasionally and was mild. Hearing was normal. The patient was advised that it would be necessary to enter the mastoid surgically because of the probability of a low grade infection. On June 14, 1926, the mastoid was opened. From the antrum to the tip, there was rarefication and necrosis of the mastoid cells, with all surfaces presenting a glistening white and dry appearance. There was complete absence of moisture in the mastoid. Complete exenteration to normal bone was carried out. A modified radical operation of the Bárány type was done; the drum membrane and tympanum were left intact. The postoperative course was uneventful; a culture showed no growth. Two years following the operation, inquiry disclosed that there had been no further trouble with the ear.

SUMMARY

Dry necrosis of the mastoid is a condition of infrequent occurrence. It is the end-result of a mastoiditis of long duration and low virulence. The tympanum may be found normal or may show a chronic suppuration. Judging from what is known of the habits of the type III pneumococcus or *Streptococcus mucosus*,[13] it may be that dry necrosis represents the typical end-result of this type of mastoid infection.

Just why this rare condition of the mastoid should ever supervene is interesting material for speculation. Is it as follows? A fleeting

13. It is commonly accepted that type III pneumococcus is identical with *Streptococcus mucosus*. The following personal communication to the authors from O. T. Avery of the Rockefeller Institute, however, gives a different view which must be kept in mind in carrying out bacteriologic studies of suppurative otitis:

"The earlier work of Park and Williams (1905) and the subsequent studies of other investigators show that the organism formerly classed as *Streptococcus mucosus*, should be placed with the pneumococcus, under the common name of *Pneumococcus mucosus*, since it has many characteristics in common with the pneumococcus group. Considerable confusion has existed in bacteriological literature, regarding the identity of the so-called *Pneumococcus mucosus* and *Streptococcus mucosus*. *Pneumococcus mucosus* or type 3 pneumococcus possesses characteristics typical of pneumococcus and is bile-soluble, ferments inulin, possesses a capsule, is virulent for mice, produces a greenish decoloration on blood media, and reacts specifically with antipneumococcus serum type III. Occasionally strains are encountered which, although having a similar mucoid heaped-up confluent colony and possessing a capsule, are, however, not bile-soluble, do not ferment inulin, are not so pathogenic for mice, and have a greater tendency to produce hemolysis on blood agar. These strains conform to the *Streptococcus mucosus*, and like other streptococci do not react specifically with anti-pneumococcus serum type III.

"The *Pneumococcus mucosus* is more commonly encountered in disease processes, and occurs in about 10 to 15 per cent of cases of pneumococcus pneumonia. It has also been found in other diseases such as mastoiditis, meningitis, peritonitis, etc."

*Pneumococcus mucosus* infection of the tympanum pases into the mastoid cells. The aditus becomes obstructed. Involvement of the mucosa is soon followed by osteitis. The surrounding shell is strong enough to resist invasion. There is a limited amount of exudate, insufficient in most cases to cause symptoms of pressure. As the partitions of the mastoid cells break down, the blood supply is cut off. Slowly the exudate is absorbed by the surrounding shell which retains its circulation, and the invading organism perishes. Finally, the disintegrated cell walls become a mass of dry bluish-black bone remnants which may become entirely absorbed, as in case 1, leaving an empty mastoid shell.

## CONCLUSIONS

Cultures should be obtained in every case of acute suppurative otitis in order to enable the otologist to predict the possibility of the pathologic sequence described. If type III pneumococcus or *Streptococcus mucosus* is found, the patient should not be discharged as cured when the drum membrane and hearing have returned to normal, but should be kept under observation for many months; finally, roentgenograms should be made to determine whether or not the mastoid is normal.

1000 Carleton Building.

# THE INOPERABLE TONSIL

## TREATMENT WITH RADIUM IN PREFERENCE TO OTHER NON-OPERATIVE METHODS *

J. COLEMAN SCAL, M.D.
NEW YORK

After considerable observation of the use of nonoperative methods in the treatment of diseased tonsils, which for one reason or another cannot be removed surgically, I still prefer radium to all other measures. With the improved technic in the preparation and the application of the radon seeds, disease of the tonsils can be eliminated in from one to three months.

Removable platinum seeds (radon seeds), each about 4 mm. long, are my choice. They have a screenage of 0.33 mm. thickness of platinum, which practically eliminates 98.5 per cent of the caustic beta rays. Each radon seed contains about 2.56 millicuries of radium emanation, but can be made to contain more or less emanation, as required. After the seed has been in situ for five or six days, it is removed by means of a silk thread attached to one end of the seed. At the end of this time, the maximal activity of the radon is spent, as the radon decays at the rate of 0.747 per cent of its activity each succeeding hour. The maximal dosage for each millicurie of emanation is 133 millicurie hours; the highest amount of radiation is therefore obtained during the first five or six days. This amount is sufficient to affect the lymphoid tissue of the tonsil so as practically to eliminate it without injuring any adjacent structures.

In those cases in which the tonsils were firboid because of repeated attacks of peritonsillitis, the end-results were far from satisfactory. The fibroid tonsil was not visibly affected by this method, though in each case the patient admitted improvement and often freedom from further attacks of tonsillitis.

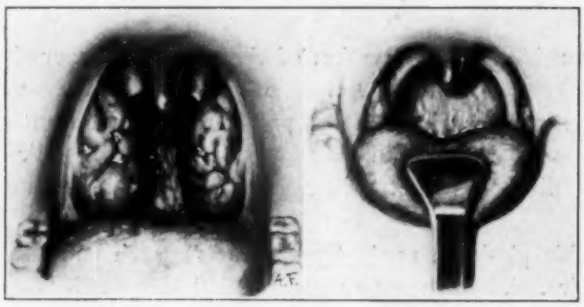
The method of application is important. Several colleagues who have tried this method of treatment without success attribute the failure to the fact that the seed fell out and to the resulting insufficient radiation. In watching their technic, I found that the seed was not embedded deeply enough and that the muscular action of the palate and pillars in swallowing therefore tended to dislodge it. The seed should be planted centrally into the tonsil, so that the end of the seed is at least 2 mm. below the surface. This will assure an equal amount of radiation to the entire

* Submitted for publication, Oct. 23, 1929.

* From the Oto-Laryngological Service, Beth Israel Hospital.

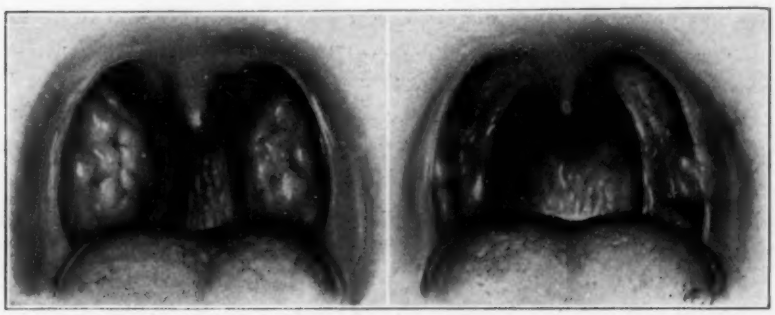
tonsil. Recently I changed my technic. Whereas I previously used one seed containing an average dose of about 3 millicuries of radon for each tonsil, I now use two seeds for each tonsil, each seed containing 1.5 millicurie. The tonsil is divided by an imaginary line and one seed is implanted in the center of each half. By this means, a better and more complete radiation is obtained and the end-result is far more satisfactory.

The advantages of this treatment are that no anesthetic is required,



A B

Fig. 1.—*A*, before treatment with radium; *B*, four months after treatment with radium.



A B

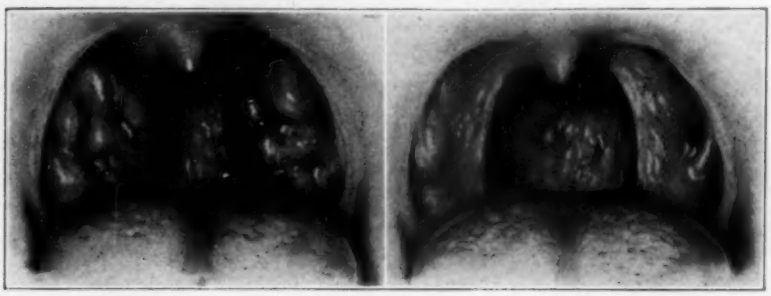
Fig. 2.—*A*, before treatment with radium; *B*, one year after treatment with radium.

confinement to the hospital is unnecessary, and there is practically no disability. Only one treatment is necessary. There is seldom any reaction.

In studying the recent methods of eliminating the tonsils the radical operation of tonsillectomy was found to be the most efficient. The ideal method is the complete enucleation of the tonsil without damage to the pillars or to the adjacent structures. Even if such a procedure is followed, and immediately after operation the pillars are found to be intact

and the faucial arch symmetrical, examination of the throat several months later will show a different picture. This is due to the granulations covering the exposed muscles with the consequent cicatricial contraction of the pillars and arches.

The electrocoagulation method of eliminating the tonsils is the application of the high frequency current from a properly regulated machine. This procedure can be carried out only by skilful hands; otherwise, considerable damage and destruction will be produced. It is extremely



A B

Fig. 3.—*A*, before treatment with radium; *B*, six months after treatment with radium.

A B

Fig. 4.—*A*, before treatment with radium; *B*, six months after treatment with radium.

difficult to treat submerged and adherent tonsils by this method without damaging adjacent structures.

The roentgen method of treatment which was advocated and recommended by Witherbee has fallen into disrepute, and is not being used now. This method consisted in giving a course of roentgen treatment to the neck in the attempt to atrophy the tonsils. The result, while having a slight effect on the tonsils, also acted on the adjacent lymph glands, and dry mouth resulted. The tonsil itself was never affected enough to eliminate the focal infective condition.

SUMMARY

The treatment of inoperable tonsils with the implantation of removable platinum radon seeds is an adequate substitute for tonsillectomy in those cases in which surgery is contraindicated.

Only one treatment is necessary. There is no hospitalization and no anesthetic, and the patient has no pain or discomfort in attending to his usual occupation.

As compared with the roentgen treatment, the radium exerts its action only on the lymphoid tissues in the area implanted, without affecting the adjacent tissues. The roentgen rays affect all the tissues and result in annoying after-effects. Electrocoagulation likewise can be used only by skilled hands; even then, there is the possibility of damaging the adjacent structures.

44 West Seventy-Fourth Street.

# SURVEY OF THE HEARING OF THE SCHOOL CHILDREN OF SAN FRANCISCO*

FRANK H. RODIN, M.D.
SAN FRANCISCO

The following is the first report showing a systematic survey of the hearing of all the school children of a large city, from 9 to 16 years of age.

The introduction of the phonograph audiometer [1] (Western Electric No. 4-*A*) made possible the testing of the hearing of a large number of persons at one time. This instrument is now used in many cities for the examination of school children.

The phonograph audiometer (fig. 1) is an instrument consisting of a phonograph and records through which speech vibrations, consisting of numbers, are conducted to telephone receivers attached to the hearers' ears. Forty persons can be tested at one time. Figure 2 shows an arrangement of such a group. Blank forms (fig. 3) are distributed to the children on which they write the numbers as they hear them. The loudness of the consecutive numbers is decreased in uniform steps, and by comparing the recorded observations of the children with a master sheet, the hearing rating of each child is readily determined. The phonograph audiometer is calibrated in sensation units,[2] which is the unit adopted by Harvey Fletcher.

## METHOD OF EXAMINATION

The examination at San Francisco was carried out as follows: The board of health in cooperation with the board of education and the parochial schools undertook a systematic survey of the hearing of all school children from grade 4 through junior high school. This included the children from the ages of 9 to 16 years. Grade 4 was chosen as a starting point because children at that age are old enough to cooperate with the examiner. It took two years to complete this survey.

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* Submitted for publication, Sept. 6, 1929.

* From the Division of School Health Inspection, Department of Public Health, William C. Hassler, M. D., Health Officer.

1. Fowler, E. P., and Fletcher, Harvey: Three Million Deafened School Children, J. A. M. A. **87**:1877 (Dec. 4) 1926.

2. To convert from loss of hearing in sensation units to percentage of hearing loss for speech, multiply by 0.83. See Fletcher, Harvey: New Methods and Apparatus for Testing the Acuity of Hearing, Laryngoscope **35**:501 (July) 1925.

A technician, supplied by the board of education, using the phonograph audiometer, tested the children.[3] Those who had a loss of 9 or more sensation units in one or both ears were retested. The children who on the retest showed a loss of 9 or more sensation units in one or both ears were examined by the otologist of the board of health. He also examined children from the lower grades who, according to the teachers, had some hearing defects. The examination was conducted at

Fig. 1.—The phonograph audiometer.

Fig. 2.—Testing of children.

school. A brief history of any ear complaint was obtained. The ears were examined with an electric otoscope, and an inspection of the mouth was made. The otologist made such other tests as he thought necessary for the proper diagnosis of the child's hearing condition, and his observations were recorded on the back of the blank form used by the child (fig. 4).

3. Van Deveer, B.: The Hearing Survey of the San Francisco Public Schools, Volta Rev. **30**:761 (Nov.) 1928.

The otologist examined the children with the following objects in view: first, to discover, if possible, the cause or causes producing the loss of hearing which may need medical attention; second, to find the children who had such an impairment of hearing that they were in need of instruction in lip reading. With the first type of children the parents were notified by a card (figs. 5 and 6) calling attention to their child's loss of hearing and to any correctable defect that may have been found by the examiner. On this card the loss of hearing in sensation units was converted into percentage of loss of hearing, so that it might be understood by the parents. The names of the children who were in

SCH. HEALTH F. 21

**DEPARTMENT OF PUBLIC HEALTH, SAN FRANCISCO, CALIF.**
DIVISION SCHOOL HEALTH INSPECTION — HEARING TEST REPORT

NAME _____ AGE _____

SCHOOL _____ GRADE _____ DATE _____ 19____

| HEARING LOSS | RIGHT EAR | | | | LEFT EAR | | | | HEARING LOSS |
|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | |
| 30 | | | | | | | | | 30 |
| 27 | | | | | | | | | 27 |
| 24 | | | | | | | | | 24 |
| 21 | | | | | | | | | 21 |
| 18 | | | | | | | | | 18 |
| 15 | | | | | | | | | 15 |
| 12 | | | | | | | | | 12 |
| 9 | | | | | | | | | 9 |
| 6 | | | | | | | | | 6 |
| 3 | | | | | | | | | 3 |
| 0 | | | | | | | | | 0 |
| −3 | | | | | | | | | −3 |

HEARING LOSS (left) HEARING LOSS (right)

Any history of ear trouble?.....

Fig. 3.—Blank form for use by child.

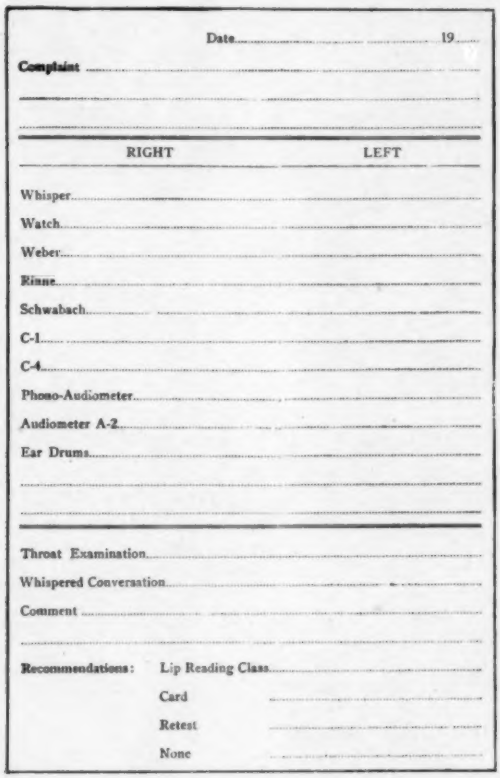
need of instruction in lip reading were given to the board of education (figs. 7 and 8). It is the aim of the board of health to test all the children every three years.

## RESULT OF SURVEY

There were 118 schools examined consisting of 18,283 boys and 17,908 girls, a total of 36,191 children. On the first test 6,592 children had a loss of 9 or more sensation units in one or both ears, or 17.7 per cent. On the retest, 3,427 children had a loss of 9 or more sensation units in one or both ears, or 9.5 per cent. This is 52 per cent of the children who had a loss of hearing in the first test. The percentage of children who had a loss of 9 or more sensation units in one ear, the other ear having normal hearing, was 6.5, while 3 per cent had a loss

of 9 or more sensation units in both ears. The percentage of children who had a loss of 30 or more sensation units in one ear, the other ear having normal hearing, was 1.1, while 0.2 per cent had a loss of 30 or more sensation units in both ears.

The number of children referred for instruction in lip reading was 441: in their own schools (hard of hearing children), 207 boys and 178 girls, a total of 385; in special classes (deafened children), 30 boys and



Date..... 19.....

Complaint .....

.....

.....

| RIGHT | LEFT |
|---|---|
| Whisper..... | |
| Watch..... | |
| Weber..... | |
| Rinne..... | |
| Schwabach..... | |
| C-1..... | |
| C-4..... | |
| Phono-Audiometer..... | |
| Audiometer A-2..... | |
| Ear Drums..... | |
| ..... | |
| ..... | |

Throat Examination.....

Whispered Conversation.....

Comment .....

.....

Recommendations: Lip Reading Class.....

Card .....

Retest .....

None .....

Fig. 4.—Blank form for the use of otologist: C—1 = 64 double vibrations; C—4 = 2,048 double vibrations.

22 girls, a total of 52; in the school for the deaf, 2 boys and 2 girls. The percentage of children needing training in lip reading was 1.2, or 12.8 of those having a loss of 9 or more sensation units in one or both ears.

### CORRECTABLE DEFECTS

There were 3,478 children examined by the otologist, and 1,073 notification cards were sent to the parents. The following correctable defects were found (table 2): large and infected tonsils, 355; dis-

charging ears, 185; impacted cerumen in one ear, 180; impacted cerumen in both ears, 114, and nose troubles, 19. The total number of defects was 853. To this list of defects should be added drums with marked retraction, large dry perforations and granulations, which, if treated, may result in improvement in hearing.

TABLE 1.—*Summary of the Hearing Survey of the School Children of San Francisco*

| | | Number of Children | Per Cent of Total Number of Children Tested | Per Cent of Children Who on Retest Had a Loss of Nine or More Sensation Units in One or Both Ears |
|---|---|---|---|---|
| Number of children tested: | | | | |
| Boys | 18,283 | | | |
| Girls | 17,908 | 36,191 | | |
| Number of children who on first test had a loss of nine or more sensation units in one or both ears: | | | | |
| Boys | 3,424 | | | |
| Girls | 3,168 | 6,592 | 17.7 | |
| Number of children who on retest had a loss of nine or more sensation units in one or both ears: | | | | |
| Boys | 1,859 | | | |
| Girls | 1,568 | 3,427 | 9.5 | |
| Number of children who on retest had a loss of nine or more sensation units in one ear, the other ear having normal hearing | | 2,348 | 6.5 | 68.5 |
| Number of children who on retest had a loss of nine or more sensation units in both ears | | 1,079 | 3 | 31.5 |
| Number of children who on retest had a loss of thirty or more sensation units in one ear, the other ear having normal hearing | | 382 | 1.1 | 11 |
| Number of children who on retest had a loss of thirty or more sensation units in both ears | | 65 | 0.2 | 1.9 |
| Number of children recommended for instruction in lip reading: | | | | |
| Hard of hearing children (in their own school): | | | | |
| Boys | 207 | | | |
| Girls | 178 | 385 | | |
| Deafened children (in special classes): | | | | |
| Boys | 30 | | | |
| Girls | 22 | 52 | | |
| Deaf children: | | | | |
| Boys | 2 | | | |
| Girls | 2 | 4 | 441 | 1.2 | 12.8 |
| Number of children who on retest had a loss of nine or more sensation units in one or both ears and who had an operation on the mastoid; five of them had operations on both mastoids | | 98 | ... | 2.9 |

## RESULTS OBTAINED FROM THE NOTIFICATION CARDS SENT TO THE PARENTS

There were 1,073 cards sent to the parents notifying them about their child's ear condition (table 3). These cards were followed up by visits from the school nurses to the home of the child if it was necessary, with the following results: 490, or 46 per cent of the children, received medical attention, while in 241 cases, or 22 per cent, the parents promised to have medical attention given. Fifty-nine parents, or 6 per cent, refused to have any medical attention given; 116, or 11 per cent, refused to cooperate with the nurses, and 167, or 15 per cent, could not be found at home.

It is unnecessary to discuss fully the relation of the defects found to the loss of hearing. The close relation of hypertrophied and infected tonsils to impaired hearing is well known to all otologists. Discharging ears under proper treatment can often be cured with resulting improvement in hearing, or with the prevention of further loss of hearing. The majority of the children with discharging ears had had little or no medical attention and were not under medical care when examined. Some of the children with impacted cerumen gave a history of impaired hearing of long standing of the affected ear.

TABLE 2.—*Defects Found*

| | | |
|---|---|---|
| Number of children examined by the otologist | | 3,478 |
| Number of notification cards sent to the parents | | 1,073 |
| Defects: Large and infected tonsils | | 355 |
| Discharging ears | | 185 |
| Cerumen in one ear | 180 | |
| Cerumen in both ears | 114 | 294 |
| Nose troubles | | 19 |
| Total number of defects found | | 853 |

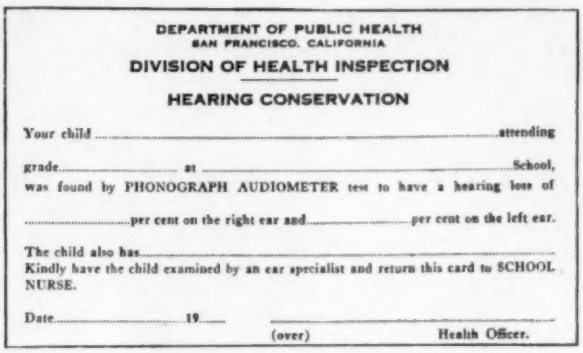
TABLE 3.—*Results Obtained from the Notification Cards Sent to the Parents*

| | Number | Per Cent |
|---|---|---|
| Children who received medical attention | 490 | 46 |
| Children whose parents promised medical attention | 241 | 22 |
| Children whose parents opposed medical attention | 59 | 6 |
| Children whose parents refused to cooperate | 116 | 11 |
| Children whose parents could not be found at home | 167 | 15 |
| Total number of notification cards sent to the parents | 1,073 | 100 |

## HARD OF HEARING, DEAFENED AND DEAF CHILD

For educational purposes it is best to differentiate between the hard of hearing, the deafened and the deaf child. A deaf child is one who either was born deaf or acquired deafness early in life, usually before the sixth year, and whose loss of hearing in the better ear is about 50 sensation units or more. Usually these children have no speech. A hard of hearing child is one who has some impairment of hearing—enough to interfere with his education—which later may act as a handicap in his ability to earn a living. These children usually have a loss of hearing of 15 sensation units and no more than 25 in the better ear. In this group are usually included children who have normal hearing in one ear and a loss of 30 or more sensation units in the other. The deafened child is one between the group of the hard of hearing children and the group of the deaf children, and one who has speech. To this group belong children with a loss of 25 and no more than 50 sensation units in the better ear.

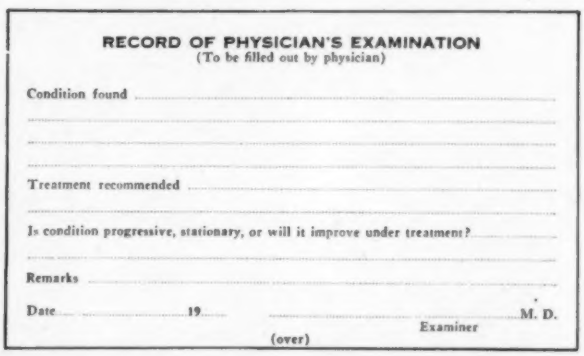
The term deaf child applied to one who has a moderate loss of hearing is an unfortunate one: the word "deaf" unduly alarms the parents and the child. These children are not deaf: they are hard of hearing, and should be called hard of hearing children. A child that has a marked loss of hearing and has speech is usually not a deaf child but a deafened child.



DEPARTMENT OF PUBLIC HEALTH
SAN FRANCISCO, CALIFORNIA
DIVISION OF HEALTH INSPECTION
HEARING CONSERVATION

Your child .....attending
grade..... at .....School,
was found by PHONOGRAPH AUDIOMETER test to have a hearing loss of
.....per cent on the right ear and.....per cent on the left ear.
The child also has.....
Kindly have the child examined by an ear specialist and return this card to SCHOOL NURSE.
Date.....19.....
(over) Health Officer.

Fig. 5.—Notification card sent to the parents.



RECORD OF PHYSICIAN'S EXAMINATION
(To be filled out by physician)

Condition found .....
.....
.....
.....
Treatment recommended .....
.....
Is condition progressive, stationary, or will it improve under treatment?.....
.....
Remarks .....
Date..... .....19..... .....M. D.
Examiner
(over)

Fig. 6.—Record of physician's examination to be written on the reverse side of the notification card.

## IMPAIRMENT OF HEARING NECESSITATING INSTRUCTION IN LIP READING

It is not always easy to decide just how much loss of hearing incapacitates a child so that instruction in lip reading is necessary. Children cannot be standardized as adults. Children will vary: one child with normal hearing in one ear and a total loss of hearing in the other ear will have no difficulty in following a whispered conversation, and may even be unaware of the fact that he has one deaf ear; another child with normal hearing in one ear and a moderate loss of hearing in the other.

say a loss of 21 sensation units, will be backward in his class work, have difficulty in hearing and be absolutely unable to follow a whispered conversation. All factors have to be considered, such as: type of deafness,

**SAN FRANCISCO PUBLIC SCHOOLS**
**CONSERVATION OF HEARING**
**PUPIL'S RECORD**

To be filled out by Lip-Reading Teacher and treated as confidential.

Name ..... Address ..... Telephone .....
School ..... Grade .....
Date of Birth ..... Place of Birth .....
Nationality ..... Sex .....
Name of Parent .....
Referred to Lip-Reading by ..... Lip-Reading Teacher .....
Date of Enrollment ..... Date of Dismissal .....

To be filled out by the Otologist

History of Ear Condition .....

Condition of Hearing:
4A Audiometer. Right ..... Left .....
2A Audiometer. Right ..... Left .....
Whispered Conversation .....
Drum Membrane Right ..... Left .....
Treatment .....
Remarks .....
Date ..... Examiner .....

Fig. 7.—Card of child referred for instruction in lip reading.

**ACADEMIC RECORD**

Grade Repeated ..... Double Promotion .....

| Educational Tests | Date | Reading Age | Arithmetic Age | Spelling Age |
|---|---|---|---|---|
| | | | | |
| | | | | |

Judgment of Teacher .....

**REPORT OF PSYCHOLOGICAL EXAMINATION**

Date ..... Test Given .....
M. A. ..... I. Q. ..... Diag. .....
.....
..... Examiner.

Remarks: .....

Fig. 8.—Reverse side of figure 7.

condition of ear drums, improvement expected under treatment, response to whispered conversation, and the scholastic record, before recommending a child for instruction in lip reading. A consultation with the principal or teacher may be of aid in making the decision. "Any deafened

child whose retardation is greater than the average retardation of normal hearing children should be placed in the class for lip reading training." [4]

The hard of hearing children receive instruction in lip reading in their own schools. A special teacher of lip reading visits the schools and instructs these children, giving two half-hour periods a week. When there is a teacher in the school qualified to give such instruction, this is done by her. For deafened children a room is set aside in an ordinary school building, where they receive intensive training in lip reading under a specially trained teacher. These children take some of their lessons in the ordinary classrooms, but most of their work is done in the special room with the teacher of lip reading. "To educate deafened children with deaf children will ultimately distort the speech of the deafened children." [5] The deaf child is educated in a special school for the deaf.

TABLE 4.—*Nationalities of Children Attending the School for the Deaf*

| | |
|---|---|
| American (white) | 29 |
| Italian | 6 |
| Irish | 2 |
| Greek | 1 |
| German | 1 |
| Scotch | 1 |
| Austrian | 1 |
| Hungarian | 1 |
| Roumanian | 1 |

## ORAL DAY SCHOOL FOR THE DEAF

The children attending the school for the deaf were tested individually with a tone range audiometer (Western Electric No. 2 *A*).

There were forty-three children attending the school for the deaf. There were twenty-four children with congenital deafness: twelve boys and twelve girls; and nineteen with acquired deafness: ten boys and nine girls.

In studying the nationalities of these children, only those children were classified as foreign who were born in a foreign country or whose parents were both born in a foreign country. All other children were classified as American (table 4). There were twenty-nine American (white) children; six Italian; two Irish; and one each of Greek, Scotch, Austrian, Hungarian and Roumanian descent. In one of the cases in which the children were classified as American, the mother was American and the father was Russian; in one the mother was American and the father was Scotch, and in one the father was American and the

4. The Deafened School Child, Report of the Joint Committee on Health Problems in Education of the National Education Association and the American Medical Association, 1928, p. 33.

5. Footnote 4, p. 31.

mother was a native of the Philippine Islands. In the case of the German nationality, the father was German and the mother was born in Peru. In that of the Roumanian nationality, the father was Roumanian and the mother was Bulgarian, while the child was born in Constantinople.

The etiology of the children with acquired deafness was as follows (table 5): meningitis, six; infantile paralysis, three, two showed evidence of paralysis of the lower limbs; injury, two, one with a history of a fall when 5 years of age and another with a history of a fall when 9 months old; whooping cough, two, in one case the parents were first cousins; suppurative otitis media, with abscesses of the ears when 1½ years of age, one; suppurative otitis media, with bilateral mastoiditis and operations, one; influenza, one; diphtheria, one; measles, one, and

TABLE 5.—*Etiology of Acquired Deafness of Children Attending the School for the Deaf*

| Cause | Number | Comment |
|---|---|---|
| Meningitis | 6 | |
| Infantile paralysis | 3 | Two show evidence of paralysis of the lower limbs |
| Injury | 2 | One had a fall when 5 years of age; one had a fall when 9 months old |
| Whooping cough | 2 | Parents of one child are first cousins |
| Suppurative otitis media | 1 | Abscesses of the ears when 1½ years old |
| Suppurative otitis media with bilateral mastoiditis and operations | 1 | |
| Influenza | 1 | |
| Diphtheria | 1 | |
| Measles | 1 | |
| Syphilis (?) | 1 | |
| Total | 19 | |

syphilis (?), one. It will be noticed that meningitis and infantile paralysis were responsible for almost half of the cases.

Of the twenty-four children with congenital deafness, twenty-three were tested with the audiometer, and one was too young to test. Of these, fifteen, or 65.2 per cent, had a loss of between 48 and 75 sensation units in the better ear, and eight, or 34.8 per cent, had a loss of between 76 and 120 sensation units.

Of the nineteen children with acquired deafness, sixteen were tested, and three were too young to test. Six, or 35 per cent, had a loss of between 42 and 75 sensation units in the better ear, and ten, or 62.5 per cent, had a loss of between 76 and 120 sensation units.

## COMMENT

One of the most serious handicaps to any child is an impairment of hearing. Even a moderate degree of deafness is often an obstacle in the education of the young. One of the chief causes of retardation and inattention in class work is difficulty in hearing. A diminution in the

acuity of hearing in early life, if not corrected, often progresses to a marked loss of hearing later in life.

This survey made at San Francisco shows the value of a survey of the sense of hearing and the ease with which school children may be examined. No other method could have made possible such a systematic examination of 36,191 children in such a short period with one technician and an otologist as that using the phonograph audiometer.

It is interesting to note that of the 36,191 children tested, 50.5 per cent were boys and 49.5 per cent were girls. On the retest, of the 3,427 children who had a loss of nine or more sensation units in one or both ears, 54 per cent were boys and 46 per cent were girls. Of the 441 children referred for instruction in lip reading, 54 per cent were boys and 46 per cent were girls. Just why there should be a larger number of boys than girls who have a loss of hearing and who are in need of training in lip reading I do not know. There were 98 children who on retest had a loss of nine or more sensation units in one or both ears and who had an operation on the mastoid; five of them had operations on both mastoids. This is 2.9 per cent of the children who had a loss of hearing.

There is a definite relation between defective hearing and disorders of speech. According to Glassburg:[6]

> The ears should be examined in every case of defective phonation associated with any degree of diminished hearing, for the speech defect may be due to the inability of the child to hear the finer shadings of his own voice. The relation of the auditory sense to speech is well illustrated by the deaf, who possess a monotonous colorless speech. It is a well known fact that children who cannot hear will not of their own accord learn to speak. The deafness may be due to a congenital defect in the structure of the ear or to adenoids, hypertrophied tonsils, abscesses and obstructions of the air passages. Removal of the obstruction will often improve the hearing and through it the speech.

The finding of 1.2 per cent of the children between the ages of 9 and 16 with a sufficient impairment of hearing to necessitate training in lip reading justifies the systematic and periodic examination of all school children to locate defects that, if uncorrected, may eventually lead to permanent loss of hearing.

The value of such a survey is well summarized in the "Deafened School Child":[7]

> 1. There are approximately 3,000,000 children in the United States having definitely measurable hearing defects.
>
> 2. These hearing defects are a serious handicap to a majority of the children.

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6. Glassburg, J. A.: Is the Treatment of Speech Disorders a Medical Problem? J. A. M. A. **92**:960 (March 23) 1929.

7. Footnote 4, pp. 11 and 12.

3. A large percentage of them repeat grades many times, costing the communities important sums for this reeducation.

4. The difficulty of securing education is likely to discourage the child and cause him to abandon his effort.

5. It is impossible to predict the future progress of a hearing defect and in consequence all must receive medical treatment, and special educational provisions must be made for many.

## SUMMARY

1. With the use of the phonograph audiometer, a hearing survey of the school children of San Francisco was made.

2. One hundred and eighteen schools were tested, consisting of 36,191 children.

3. On the first test, 6,592 children were found to have a loss of nine or more sensation units in one or both ears.

4. On retest, 3,427 children were found to have a loss of nine or more sensation units in one or both ears, or 9.5 per cent.

5. Four hundred forty-one children, or 1.2 per cent, were referred for instruction in lip reading.

6. One thousand and seventy-three notification cards were sent to the parents.

7. Forty-three children attending the school for the deaf were examined. Twenty-four children had congenital deafness and nineteen had acquired deafness.

8. A survey of the hearing of school children, a suitable audiometer being used, should be carried out every two or three years.

490 Post Street.

# IODIZED OIL AS AN AID IN THE DIAGNOSIS OF CHRONIC MAXILLARY SINUS DISEASE*

E. LLOYD JONES, M.D.
WHEELING, W. VA.

In the diagnosis of chronic maxillary sinus disease the most reliable means of investigation are lavage and roentgenographic examination. It happens not infrequently that lavage is negative, and that the roentgenogram shows bilateral moderate clouding of such nature that it is interpreted by the roentgenologist as negative for sinus disease. To subject these patients to exploratory operation through the canine fossa or to allow them to go without further study constitutes failure to take advantage of recent researches in the study of the sinuses. If it is feasible to make injections of a contrast medium into a sinus and thus outline the contents of the sinus which are not revealed by irrigation, it must be conceded that this procedure approaches, in information obtained, actual exploration of that cavity.

The use of radiopaque substances in the study of the sinuses is becoming more prevalent, fortunately, as is evidenced by the increase in the number of articles published relative to this subject. In 1926, Fraser [1] was the first to publish his observations on the use of iodized poppy seed oil 40 per cent in the investigation of the maxillary sinuses. His latest paper is most comprehensive.[2] The method is now beyond the experimental stage. However, it is only after a large mass of evidence has been gathered and sufficient experiences interchanged that one can hope to rely on the observations with as much assurance as the roentgenologist does in filling defects of the stomach.

It is my purpose in this paper to describe the methods used and to present a varied array of conditions in which the oil has helped in making a more accurate diagnosis.

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* From the Department of Otolaryngology, Wheeling Clinic.

* Read before the Section on Laryngology, Otology and Rhinology at the Eightieth Annual Session of the American Medical Association, Portland, Ore., July 11, 1929.

1. Fraser, R. H.: Iodized Oil in Otolaryngologic Diagnosis, Opaque Injection Study of Thirty-Five Maxillary Sinuses, J. Michigan M. Soc. **25**:270 (June) 1926.

2. Fraser, R. H.: Diagnostic Uses of Lipiodol, Radiology **12**:6 (Jan.) 1929.

## METHOD

After preliminary study and routine roentgenography, the antrum is punctured beneath the inferior turbinate with a small trocar. In the large majority of cases irrigation is then instituted with physiologic solution of sodium chloride, but in some, when it is felt that no pus exists, the irrigations are omitted. In no case was any appreciable change in the filling defect found to be due to the irrigating fluid itself. After irrigation, iodized sesame oil 40 per cent is injected at room temperature until the oil drips from the nose, the head being inclined slightly forward. The trocar is then withdrawn and the roentgenogram is taken within the next ten or fifteen minutes. No pack is placed in the nose. Owing to the high viscosity of the oil, a sufficient quantity does not escape during the time required to expose the film to alter the results.

The sinus must be filled completely, as indicated by seeing the oil drip from the nose with the head inclined slightly forward. Several incomplete fillings were recorded because the appearance of the oil was not awaited. Repetition of the study verified this opinion. If the head is held so that the floor of the nose is in a horizontal position, the overflow will often run posteriorly and enter the lung. This occurred in one instance of sinusitis associated with bronchiectasis to such a degree that an injection of poppy seed oil into the lungs was unnecessary to verify the diagnosis of bronchiectasis.

Injection of the oil beneath the mucosa of the naso-antral wall is possible. This is more apt to occur when the straight needle rather than the curved trocar is used. Oil beneath the mucosa will do no harm and will eventually become absorbed. During all procedure, sterile technic should be employed throughout. Although no bacteriologic studies have been made, there is no indication that iodine 40 per cent in oil will sterilize either the oil or the cavity in which it lies.

Roentgenograms are made with the patient in the Waters position (mouth widely opened, the chin and nose touching the caset). When indicated, a second exposure is made with the patient in the lateral-prone position. The Potter-Bucky diaphragm is employed whenever possible. It should be noted that in most cases one exposure before and one after the injection are all that is required. Therefore, the cost and time involved are not prohibitive to the use of this method in the routine study of sinus disease.

Every rhinologist should be able to interpret the roentgenogram and should not hesitate to question the roentgenologist's primary report if he has reason to believe from his own examination that sinus disease is present. Cooperation between the roentgenologist and the rhinologist in studying disease of the sinuses in this manner will help both materially.

The sinuses are allowed to empty themselves. The patients are warned to expectorate the oil as it drips into the pharynx. The emptying time itself was not made a subject of direct investigation for various obvious reasons. However, a sufficient number of cases was observed to indicate that the normal sinus empties itself in from twenty-four to forty-eight hours.

## RESULTS

The size, shape and capacity of an antrum can be determined accurately by the method described. The capacity is ascertained by the amount of oil required to fill the sinus. The average normal antrum is filled by from 7 to 12 cc. of the oil. An abnormally small nonpathologic antrum holds from 3 to 6 cc. of oil, whereas the pathologic one

may take from 1 to 5 cc. or more, depending on the size and nature of the contents of the antrum.

As previously stated, the emptying time of the normal sinus is less than forty-eight hours. Any appreciable delay can be considered as indicating some pathologic interference with the drainage mechanism. The longest interval during which oil was known to have remained in the sinus was three months.

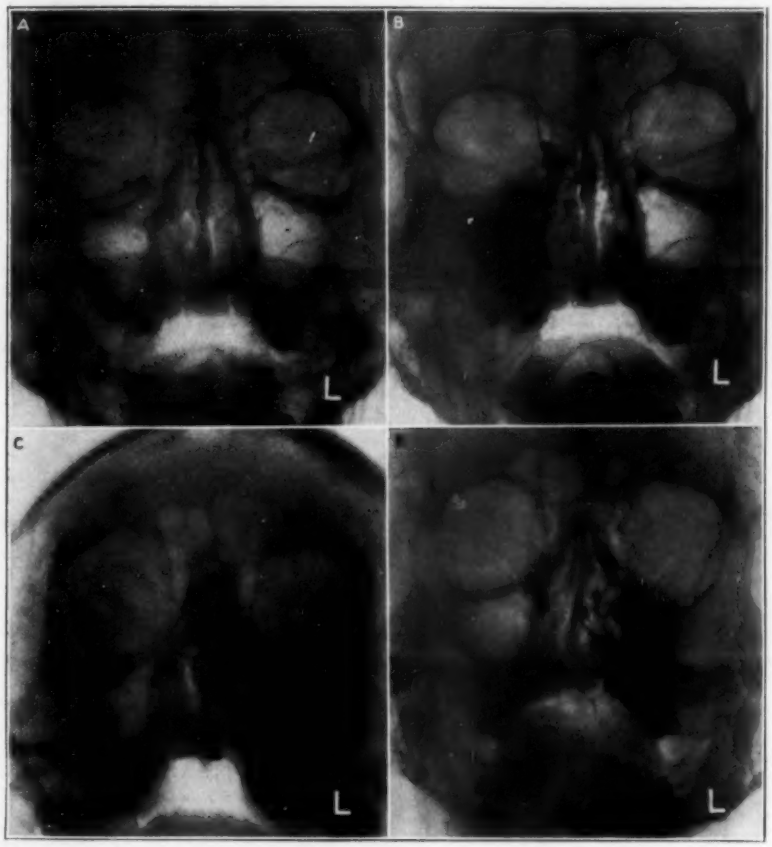


Fig. 1.—*A*, uninjected antrums—normal; *B*, same as *A*, after injection—negative; *C*, injected left antrum—septate, negative; *D*, small but normal antrum.

Roentgen examination following the injection of the oil will show whether the membrane is thickened, smooth or polypoid. When the study is repeated at intervals, any decided change in the thickness of the mucous membrane can be observed. Rapid changes do occur in the catarrhal types of sinusitis, and before beginning any radical surgical procedure it would not be amiss to repeat the injection after one or more irrigations. Often the membrane will be found to be within the normal

limit of thickness of 1 mm. It is in this class of nonsuppurative cases that the oil has its greatest use, and it is in this type of disease that much further study should be made as to diagnosis and treatment.

The diagnosis of polypi or granulation masses, especially when located in the lower part of the antrum, is often missed without the aid of opaque injection. In this type of sinus disease there are frequently

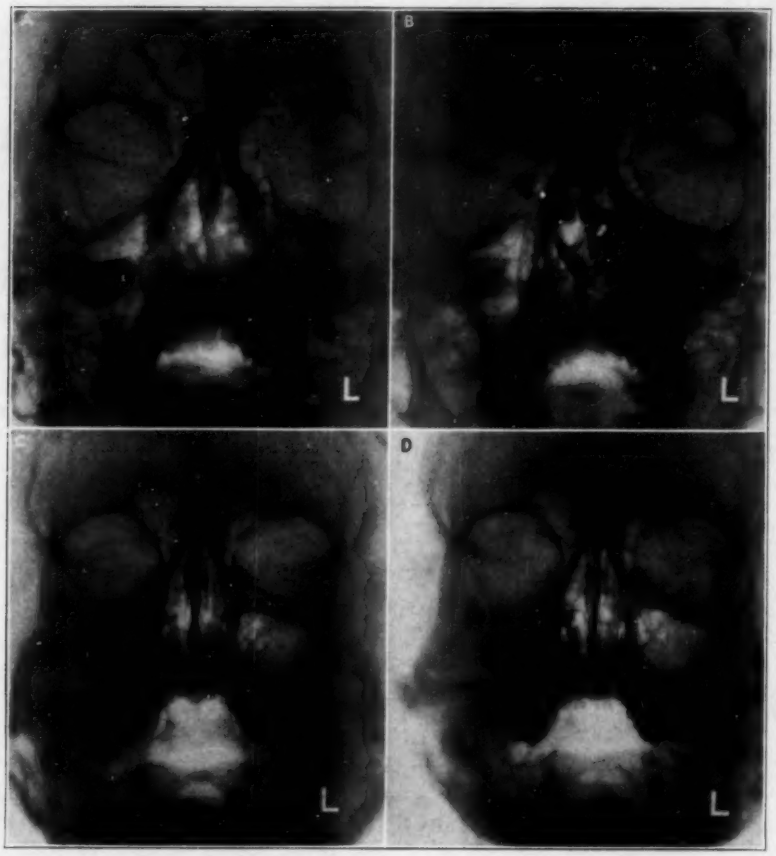


Fig. 2.—*A* and *B*, both antrums transilluminated clearly, left diffusely opaque in primary film. Irrigation produced 3 cc. of pus. Note the decided filling defect. *C* and *D*, bilateral suppurative otitis media; no nasal symptoms; right antrum slightly clouded on transillumination. Three and one-half cubic centimeters of pus was obtained on irrigation. Typical of defect obtained in chronic suppurative maxillary sinusitis.

no symptoms attributable to the sinus. Usually transillumination and irrigation reveal no positive observations and roentgenograms taken without injection reveal indefinite changes. A definite diagnosis in cases

of this type can always be made by roentgen examination following the injection of oil.

Cysts of the antrum usually transilluminate clearly. Roentgen examination without the injection of oil will probably show some increase in density of the involved sinus. If the wall of the cyst is punctured, straw-colored fluid will be obtained. If oil is injected following the withdrawal of this fluid, the size, location and contour of

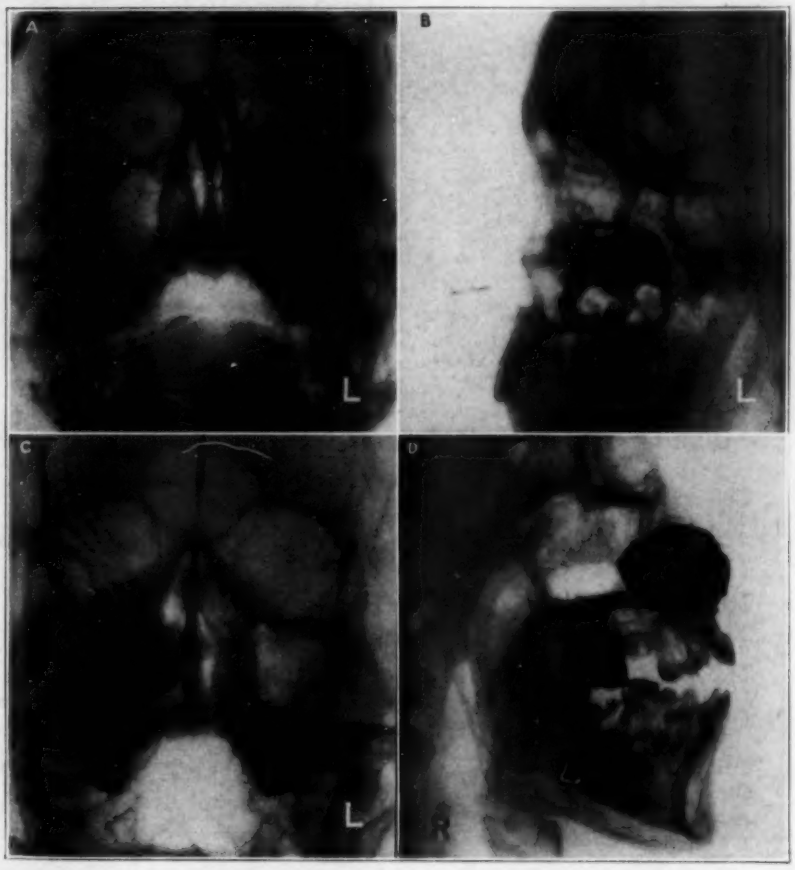


Fig. 3.—*A* and *B*, chief complaint: headache on the left side; transillumination clear. Primary film shows slight clouding suggestive of cyst in the left antrum. Irrigation negative. Note the extent of the cyst backward. *C* and *D*, dental cyst injected through the right lateral upper incisor tooth socket. Does not involve the antrum, but the bone has been eroded.

the cyst will be revealed by a positive shadow in the roentgenogram. If the wall of the cyst is not penetrated and oil is injected into the sinus about it, the cyst will be outlined from without with the production of a negative roentgen shadow.

The indications for the use of the oil may be summarized as follows: Whenever doubt exists as to the presence or nature of the disease of the sinus, radiopaque oil should be injected.

Iodinized oil should not be used or, at least, should be used with caution in any person known to have toxic goiter, active tuberculosis or iodine hypersensitivity. No untoward results have thus far been mentioned in the use of the oil in the sinuses. With the advent of

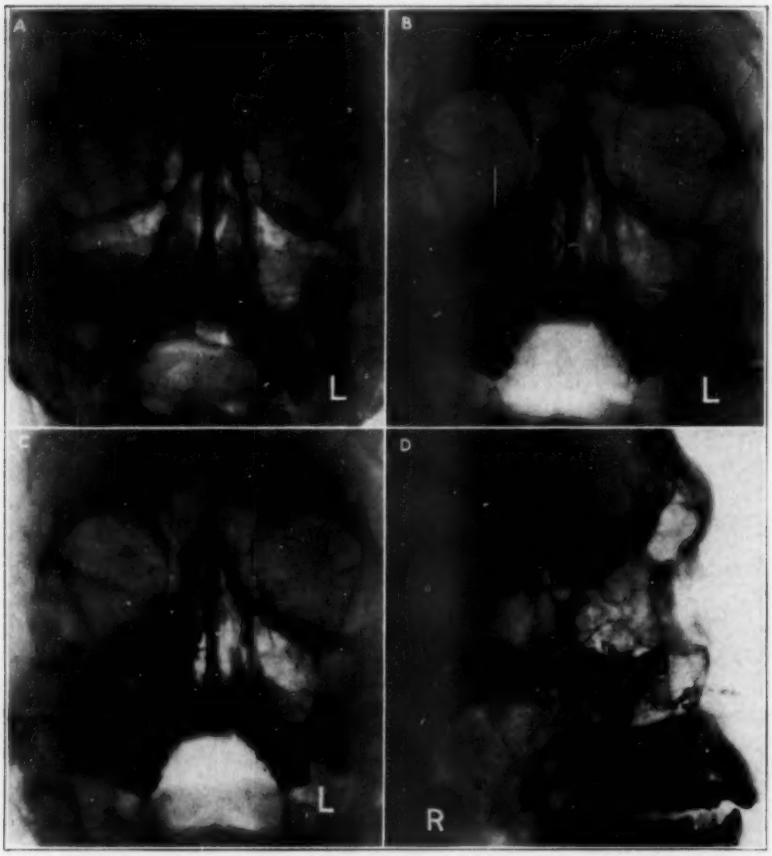


Fig. 4.—*A* and *B*, chief complaint: rheumatism; transillumination equal and clear; irrigation of right antrum negative. Primary plate is suggestive of some pathologic change in floor of right antrum. Note the defect in filling. *C* and *D*, repeated one month after *B*.

brominized oil on the market, the present contraindications ought to be eliminated.

Two hundred and eighty-seven patients have been studied by the method described. Injections were made into 425 antrums in this series. The diagnosis of disease in fifty-four antrums was verified by operative exposure through the canine fossa. It is hoped that by more

general use of radiopaque oils, either by the injection method as first described by Fraser or by the displacement method as advocated by Proetz,[3] the physiology and the pathology of the sinus will be studied in greater detail; thus, a more rational form of treatment will be evolved.

The accompanying figures are self-explanatory and show the variety of conditions in which the oil has been of material benefit in assisting to make a final diagnosis.

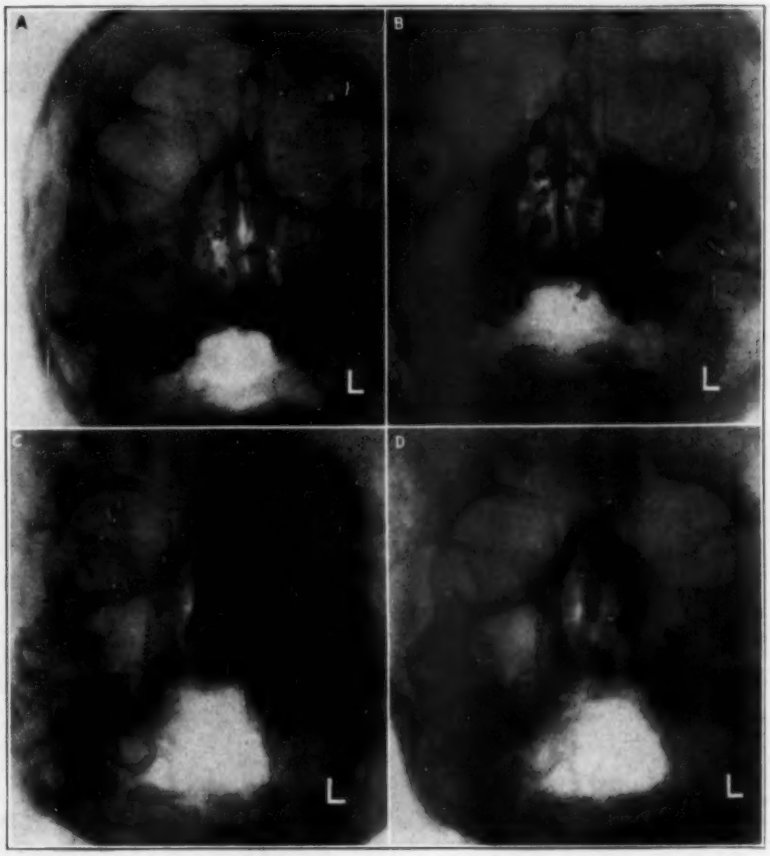


Fig. 5.—*A*, chief complaint: similar to hyperesthetic rhinitis; transillumination equal but questionably slightly clouded; no pus on irrigation. Note the large defects in filling. *B*, same antrums two weeks later, within normal limits. The symptoms have disappeared. *C*, chief complaint: anesthesia of left infra-orbital nerve; cloudy by transillumination. On irrigation obtained 2 cc. of mucoid material. *D*, six weeks later, note the increase in defect. Biopsy through canine fossa revealed sarcoma—treated by deep roentgen therapy.

3. Proetz, A. W.: Displacement Irrigation of Nasal Sinuses: New Procedure in Diagnosis and Conservative Treatment, Arch. Otolaryng. **4**:1 (July) 1926; Further Data on the Displacement Method in Sinuses, Ann. Otol. Rhin. & Laryng. **36**:297 (June) 1927.

### CONCLUSIONS

1. Radiopaque oil can be injected into the maxillary sinus without harmful effects.

2. As an aid in making the diagnosis this procedure is invaluable in the study of many obscure cases.

3. If the technic of the procedure as outlined is carefully followed, reliable information is obtained.

## ABSTRACT OF DISCUSSION

Dr. Robert Budd Karkeet, Portland, Ore.: The point on which I wish to speak is the matter of entering the maxillary sinus without making a needle puncture beneath the lower turbinate. This much abused antrum is the most accessible of all the sinuses. Every antrum has a natural ostium. Many of these may easily be entered, and many more than is generally supposed have one or more accessory openings. Schaeffer found more than 40 per cent in a large series of dissections. Since it is well known that a large accessory ostium is a predisposing cause of chronic maxillary disease, it is reasonable to suppose that in pathologic cases this percentage is much greater. When no accessory ostium is found and the natural opening is difficult of access, one may insert a curved needle through the membranous or undefended area in the middle meatus with no trauma. There is no possibility of injecting iodized oil or other solutions underneath the mucous membrane or into the mucous membrane of the opposite wall, nor is there danger of entering the orbital cavity. Of course, it is understood that the operator does not use a cannula that completely occludes the ostium. One is frequently surprised to find an opening in the middle meatus as large as a lead pencil. While a simple process needle puncture beneath the lower turbinate is disagreeable, particularly to a nervous patient. This can easily be avoided, and I urge the surgeon to investigate the middle meatus.

Dr. Robert H. Fraser, Battle Creek, Mich.: One follows his customary and preferred method in irrigation of the sinus, and it does not matter how the oil gets in. Many men like the Lichtwitz straight needle for the inferior meatus, as we do. In the size 16 caliber it is satisfactory. Sinuses which run when normal to 21 or 22 cc. are conveniently dealt with by having such a quantity of oil in the large syringe. Thinning with paraffin oil helps with the quantity and occasions no loss in the quality of detail. A 5 cc. syringe lets one feel the resistance of an abnormal ostium. Never in the series of more than 700 cases was there evidence that the membrane was raised by the needle or was maxillary sinus shock produced. For the suitable case, injection through the natural ostium, or suffusion with the patient in the prone position, does very well. In any case one obtains information by which one may escape the stall on the road of successful conduct.

Diagnosis is an arousing word. It involves classification and nomenclature. I feel that the term "chronic maxillary sinusitis" is unnecessarily vague. We no longer have much profit from a consideration of sinusitis in conglomerate. We must subclassify, as the essayist does, in reference to the latent type of case. Chronic sinusitis is not an individual disease. There are the hyperplastic, suppurative and mixed forms. Neighboring but alien countrysides look alike superficially, but they follow different laws and one cannot travel far without proper deference to the individual requirements. The intumescence and surface observations, as illustrated by Dr. Jones, along with the equally valid history of the case, are both passport and guide along those stretches of roadway which follow

diagnosis and concern treatment—not only choice of treatment but contentment with result. Granulation areas of the suppurative form are usually localized, while polyps demand survey for pansinusitis. Local treatment, successful in the suppurative cases, leaves the full bloom of the disease in the constitutionally affected hyperplastic case with its serous diathesis. Here spontaneous shrinking to normal is so questionable that opaque measurements are required for the assurance that any progress is real.

Dr. Hilding C. Anderson, Duluth, Minn.: I have been using the method for about two and a half years and have published several papers, one of which Dr. Jones quoted, but apparently misunderstood. It means that I did not write clearly. This is a most valuable method, and it helps so much, especially in the catarrhal cases mentioned by Dr. Fraser, and the sooner we use it extensively the better our diagnoses will be. Dr. Jones emphasizes that the sinus should be filled completely. This is not necessary if a fluoroscope is used. You can use partial filling, 4 or 5 cc. of oil, place the patient before the fluoroscope and, acting as your own roentgenologist, you will get more information than from a mere film. Dr. Jones misunderstood me if he thought that the roentgenologist made the diagnosis and report. I have always made my own examinations. If there is a small amount of oil in the sinus and the patient is examined with the fluoroscope, the head being tipped in various directions, the oil is observed as it flows over the various surfaces. You can swing the head to one side and bring the oil at the lateral wall, and swing it away back and get the oil at the posterior wall, then at the anterior wall—every conceivable position—and get more information than from a film. Sometimes the gravity method of introducing the oil as suggested by Proetz, can be used to advantage instead of the injection by means of trocar and syringe. It is especially satisfactory for frontal, for the maxillary and sphenoid, unless the tissues of the sphenoid are so thick that one cannot see clearly. Sometimes that is true with the fluoroscope and one must depend on a plate. It is interesting to observe the oil in the partially filled ethmoids. One can study each ethmoid cell. The level of the oil is maintained by gravity as the head is manipulated. Each single cavity maintains its level, and one can compare the walls of one with those of the other and see how closely they come together. Dr. Jones said that the oil in the mucous membranes is not harmful. I believe that it would only occasionally be dangerous, but having in mind the air embolism which comes from running air through the maxillary sinus, I think that one should be careful not to inject oil under the mucous membranes. By irrigating first, as Dr. Jones suggests, I do not believe that the accident will happen often.

Dr. Harry L. Baum, Denver: I cannot help but feel that a discussion of this subject is of value because it directs attention to the fact that injections of radiopaque substances are now firmly established as a means of diagnosis in work on the sinus, and particularly because it emphasizes the importance of study of the films by the rhinologist himself, not depending too much on the roentgenographer. I think that it is safe to say that a great many men accept the interpretation of the roentgenographer instead of studying their films carefully for their own interpretation. The use of the injection method of filling the cavities undoubtedly has a place in our work, as Dr. Jones has emphasized. The displacement method of Proetz, on the other hand, is admirable in many conditions, but in certain states of the sinus, especially the hyperplastic type, the antrum will not always fill by displacement and then it becomes necessary to introduce the oil by other methods, either through the natural ostium or by puncture, if one desires to outline its walls. I must disagree, however, with the author's statement that it is necessary to fill the cavity completely. I feel, on the other hand, that it is

desirable not to fill the cavity. I would rather spend the money for films and take more than one position than spend it for oil to fill the cavity completely, and take but one position. It is my custom to take not one exposure, but invariably three, in the three planes of the head, vertical, lateral and postero-anterior. We are studying cavities which in effect are round and we cannot get an idea of all of the surfaces unless we take roentgenograms in the three planes of the head. If the cavity is not completely filled, then one may define the fluid level, using always the horizontal ray, never the vertical. Thus one may study the walls of the sinus, in that way getting a better idea of configuration and membrane changes than with a completely filled cavity and the vertical ray. The other cavities, of course, cannot properly be mentioned here because this is a discussion of studies of the antrum, but I do feel that no such discussion is complete without a word—that unless the other sinuses are also studied in the same way, particularly the ethmoid and sphenoid, we shall not always do our patients justice. We may not draw the conclusions which we should be capable of in this day of radiopaque filling by the use of iodized oil.

Dr. E. Lloyd Jones, Wheeling, W. Va.: I agree with Dr. Fraser in saying that it is not so important as to whether the oil is injected or put into the sinus by suction as it is to cooperate with the roentgenologist in interpreting the results. The specialist should be able to interpret the films, as Dr. Baum has said. In the average town the roentgenologist is so busy doing work on the gastrointestinal tract and chest that sinuses are often neglected. As chronic infections in the sinuses seldom cause death, he is more apt to call a questionable sinus negative in contradistinction to the interpretation of the mastoids, where a questionable shadow is interpreted as definite pathologic change, in order to be on the safe side. We have used the vertical ray for several reasons. We prefer the Bucky diaphragm, and having no upright instrument we continued taking the pictures with the oil injected just as we had made them without the oil. With the sinuses completely filled I found that the pictures were entirely satisfactory, as all the sinuses operated on showed pathologic changes similar to the defects shown in the film. I wish to stress the point that this work can be done in the ordinary x-ray laboratory with a minimum amount of time and expense. It is well worth while to use it in the sinuses which might be passed as negative, but which are questionably so.

# Clinical Notes

## RECOVERY FROM ACUTE OSTEOMYELITIS FOLLOWING RADICAL OPERATION FOR THE CURE OF SUPPURATIVE FRONTAL SINUSITIS *

SAMUEL RUFF SKILLERN, JR., M.D., PHILADELPHIA

My brother, Ross Hall Skillern,[1] recently reported a death following an extensive suppurative frontal sinusitis before the Triological Society in San Francisco, and I reported a death in a similar case at a meeting of the Eastern Section of the same society last winter in Washington, D. C. I shall now describe a recovery from the same condition.

I believe this is one of the few cases—I can find mention of only five others [2]—in which the patient has been reported as living following the spreading of the osteomyelitic process after a radical operation for the cure of empyemic frontal sinusitis.

There are two main divisions of osteomyelitis: one which apparently occurs spontaneously, with a slow course, and tends to self-limitation, and the other a malignant form. The latter is more or less diffuse, and usually follows traumatism. It causes softening of the bony structure, and spreads through the canals of Breschet to involve areas of bone some distance from the original foci, leaving apparently normal bone in between. Death rapidly ensues.

In this case, there was a rapid spread of the infection through the medullary spaces of the frontal bone. The infection seemed to jump at least 3 inches backward, leaving healthy bone from the upper edge of the cut surface of the frontal plate back to the frontoparietal suture line, where the infection broke through to the scalp.

The original incision had healed nicely. The stitches were removed on the fifth and seventh days, and the drainage tube on the tenth day. The patient was discharged from the hospital as convalescent sixteen days after the operation. Five days later, or twenty-one days from the time of operation, he was readmitted for the new area of infection.

* Submitted for publication, Sept. 9, 1929.

1. Ross Hall Skillern: An Extensive Case of Acute Osteomyelitis of the Frontal Superior Maxillary Bones, Complicating Sinusitis: Operation, Apparent Recovery, Sudden Death, read before the American Laryngological, Rhinological and Otological Society, at San Francisco, July, 1929.

2. McClay: J. Laryng. & Otol., 1921, p. 478. Bulson: Tr. Am. Acad. Ophth. & Otol., 1925, p. 102. McKenzie: J. Laryng. & Otol. **42**:293 (May) 1927. Hastings: Tr. Am. Laryng. A., 1927, p. 46. Shea: Tr. Am. Laryng., Rhin. & Otol. Soc., 1928, p. 401.

REPORT OF CASE

The morning of August 16, I received a telephone call from the local surgeon of an adjacent city asking me to see a desperately ill boy and to be prepared for a radical frontal operation if I thought it necessary.

I found a boy, aged 18, confined to bed, in a very toxic condition, with his head swathed in bandages. He was attended by his physician, nurse and anxious parents. The following brief history was obtained:

The day after an afternoon of swimming, on July 27, the patient complained of a severe frontal headache, for which he consulted his family physician and obtained some headache tablets. The headache was progressive, finally requiring hospitalization, due to a fluctuating swelling 1 inch (2.5 cm.) above the inner canthus of the left eye. This was opened on August 3. The temperature at that time was 103 F. Four days later, a frontotemporal and a septal abscess required opening. On the eighth day, a second septal abscess was opened, with free drainage of foul-smelling pus.

On the twelfth day, the patient seemed to be irrational at irregular intervals and had great difficulty with his speech. On the morning of the thirteenth day, his mind seemed clearer; at this time, a roentgenogram was made of the sinuses.

When I saw the patient, he was moribund but could be aroused to answer questions. His cerebration was extremely slow; he would often given an incorrect answer, and then, after a pause of several minutes, would correct his statement.

When the dressings were removed, I found the forehead bathed in pus. A piece of rubber tubing had been carried through and through under the skin for drainage of the frontal area.

The laboratory report was: a high leukocyte count (from 12,500 to 15,000), a low red cell count (from 4,000,000 to 3,000,000) and a progressive decline in hemoglobin (70, 65, 60 per cent). There was acute glomerular nephritis, with increasing hyaline and granular casts. The Wassermann reaction was reported to me as negative.

The interesting point of the physical examination was the general weakened, anemic condition, numerous moist râles at the base of the lungs and a flabby heart muscle.

The family was advised of the precarious condition of the patient, and an immediate operation was recommended as a life-saving measure. Operation was performed within the hour.

The usual eyebrow incision was made, and a second incision was run upward around the abscess drainage opening. This flap was dissected upward; the muscle and fascia around this opening were found to be necrotic. The openings through the frontal plate were filled with degenerated polypoid tissue, granulations and pus, and the bone around the edges had a stiff, putty-like resistance. The entire anterior plate of the frontal sinus was removed, from one-fourth inch (0.6 cm.) above the supra-orbital rim to the outermost confines of the sinus, where the edges were beveled outward as much as possible.

The intersinus septum was removed in its entirety. The posterior plate contained four necrotic cuplike depressions varying in size from that of a pea to that of a large bean, and required such strenuous curettement that my assistant afterward told me he held his breath in fear that the curet would perforate into the cranial cavity.

After all areas of infection were removed as thoroughly as possible, the frontal ostium was enlarged by rasp and chisel and the wound irrigated with a 1:5,000 solution of mercuric chloride. A rubber drainage tube was run from the center

of the sinus through the enlarged ostium to the nostril; the periosteum and soft tissue were closed with catgut and the skin with silkworm gut.

Rather vigorous stimulation was required during the first twenty-four hours of the postoperative treatment. Irrigations through the drainage tube of the frontal sinus with a 1:5,000 solution of mercuric chloride were given until the irrigating fluid returned clear. These irrigations were used morning and night as long as the drainage tube remained in situ; after its removal, the nasal cavities were washed daily with a physiologic solution of sodium chloride until the patient was discharged from the hospital on the sixteenth postoperative day.

On the twentieth postoperative day, Dr. Gotwals, the attending surgeon, called me and stated that the osteomyelitic process had extended backward, and that there was an abscess in the scalp in the center line of the head directly over the fronto-parietal suture.

I advised free incision and the removal of all infected bone. He afterward told me that it was necessary to chisel a canal a half inch (1.2 cm.) wide from the top of the head to the outer edge of the eyebrow. It was necessary to resect the entire thickness of the bone, exposing the dura for over half the length of the incision. A dressing saturated with a 1:5,000 solution of mercuric chloride, which was changed hourly, was used until the wound healed by third intention.

Five months later, the patient reported to my offices with a large scar fully half an inch in breadth, extending from the top of the head to the hair line of the left eyebrow. There was a small discharging sinus at its lower end. The removal of a small sequestrum and the application of 90 per cent silver nitrate healed this sinus. There was also a small sinus over the inner angle of the eye, which contained a drop of pus.

I sent the patient to Dr. Widmann for roentgen examination. Somewhat to my surprise, the negative showed a complete regeneration of the frontal plate. There was one small scooped-out area of roughened bone in this newly formed plate, which Dr. Widmann thought was an area of healing infection.

I have since removed four small spicules of bone. At the present time, the sinus is entirely healed.

The middle of March, this patient reported to me, as he was greatly alarmed over a small swelling which had occurred in the center of the upper left eyelid just below the bony orbital ridge. Examination showed a freely moving mass the size of a dried pea, directly beneath the skin. This was kept under observation for two weeks, and, as there was no apparent change, it was tapped with a twenty-four gage hypodermic needle, without result. As I thought it might be thick pus, a small stab wound was made; the knife gave the fingers the sensation of cutting cartilaginous tissue. Four days later, this wound discharged several small drops of pus, and the mass disappeared.

On May 1, the patient reported to me and appeared to be in excellent condition.

Dr. Elmer Gotwals furnished the following history of the patient:

*History.*—N. C., a school boy, aged 18, white, American, gave as his chief complaint, pain in the left side of the face above the left eye.

*Physical Examination.*—The young man, measuring 5 feet, 10 inches in height and weighing 145 pounds (65.7 Kg.), was well developed physically and showed an excellent state of nutrition. There were no eruptions on the skin of the face or the body. The pupils were equal and reacted to light and in accommodation. No congestion of the conjunctiva was seen. The muscle action of the eyes was not impaired.

Examination of the nose showed that the septum was not deflected; the turbinate bones were slightly enlarged and congested, especially on the left side. Some

mucous secretion came from the nose. The teeth and the gums were in excellent condition. The tongue was slightly coated. The tonsils were not enlarged. The nasopharynx was slightly congested. There were no enlarged cervical or epitrochlear glands.

The chest revealed equal expansion. There were no râles or areas of impaired resonance.

The heart revealed nothing abnormal; the beat was regular, and there were no murmurs.

There were no palpable masses in the abdomen or any tender areas. The abdomen was not distended.

The extremities were normal, as were all the joints.

*Previous Medical History.*—The patient had always been well. He had never lost any time in school because of illness, and had been well all summer. On July 27, 1928, he swam in a stream of dirty water; while diving, he got more water than usual up his nose. The next day, he noticed a cold in the head. He sneezed and had a discharge from the nose, but no fever. On July 30, during the night, he began to have pain in the left side of the face above the left eye, radiating over the forehead. He consulted me on July 31, at 2 p. m. At that time, he was complaining of much pain in the left frontal region. He had a slight elevation of temperature—100.2 F.; the pulse rate was 80, and the respirations 20. He was advised to go home and go to bed. Appropriate treatment was started. He slept only at short intervals that night and complained of excruciating pain in the "frontal region" of the head.

Pain and restlessness continued the next day and night, August 1 and 2. At this time there was swelling, redness and marked tenderness above the left eye over the frontal sinus.

There was no free discharge from the nose, but the turbinate bones were greatly swollen. During the early part of the night of August 2, the pain was still marked. The patient was uneasy and nauseated, and vomited. About 2 a. m., August 3, the pain suddenly ceased, and the patient went to sleep. When I saw him in the morning, I found the left eye entirely closed, marked redness and swelling above the left eye to the midline. There was a slight mucopurulent discharge from the nose. The patient showed shock and was very ill. Above the left eye there was fluctuation extending to the midline, the forehead and around the base of the nose.

At this time the patient was moved to the Phoenixville Hospital. On admission his temperature was 103 F.; the pulse rate was 96, and the respirations 24. A blood count at this time showed: red cells, 4,470,000; white cells, 15,000, and hemoglobin, 70 per cent. The differential count showed: polymorphonuclears, 78; small leukocytes, 11; large leukocytes, 8, and transitionals, 3. The urine showed a trace of albumin and a few hyaline casts; it was otherwise normal. The heart, lungs and abdomen were normal, as was the nervous and mental condition. The patient was slightly septic and dull. After consultation, it was decided to operate. An incision was made in the midline above the base of the nose, and a drainage tube was inserted. There was a free discharge of pus from the incision. There was no bone resection at this time. The temperature dropped to 101 F., and the condition of the patient was better.

The next day, the temperature rose to 102 F., and stayed between 100 and 102 F. for several days. The swelling and edema around the eye continued. The patient remained dull and stupid; he experienced much headache, sleeplessness and loss of appetite. On August 7, fluctuation was discovered at the outer and upper border of the left eye. The patient was given nitrous oxide anesthesia, and an incision was made above the left eye; a tube was inserted, connecting the opening

made on August 3 in the midline. There was a free discharge of pus at this time. The temperature dropped to normal, the pulse rate to 80 and the respirations to 20. The condition of the patient was much better for the next three or four days. The temperature was not above 100 F. The patient slept better and took more nourishment. There was free drainage from both incisions. There was also fluctuation on the left nasal septum, which was punctured, followed by free drainage.

On August 11, I left for my vacation and turned the case over to Dr. C. F. Doran. Four days later, Dr. S. R. Skillern, Jr., was called in consultation.

On assuming charge of the case again, one week after the sinus operation, I found, about 1½ inches above the incision, a small opening in the scalp from which pus was being discharged. There was little discharge each day. On August 23 the temperature was normal; it was not elevated until August 27, and then only a little. The patient was now eating well and gaining in strength rapidly. He was allowed to get out of bed, and he soon walked about; he was allowed to go home on September 4. There was still some discharge from the opening in the scalp above the sinus incision. After being home for two days the patient complained of more headache, some nausea, poor appetite and sleeplessness. At this time, the discharge from the scalp became free. In the left frontal and parietal region, the scalp became tender, swollen and boggy. The upper left eyelid was swollen. Pus was being discharged from the outer end of the incision of the sinus operation. A diagnosis of osteomyelitis of the scalp was made, and the patient was removed to the hospital on September 10. A consultation with Dr. Skillern was held by telephone. He advised free incision until healthy periosteum and bone were reached; the resection of all diseased bone, and that the wound be packed with selvaged gauze, kept continuously moist with a 1:10,000 solution of mercuric chloride and the incision allowed to heal by third intention. A long incision was made extending from the temporal region diagonally toward the midline of the scalp back to the crown of the head. A counter incision was made, extending to the left zygomatic fossa. There was marked edema of the skin and pericranial tissue. The periosteum was honeycombed in many places. The midline incision was continued until healthy periosteum was found. A small counter-incision was made in the frontal region above the left eye. This large area was then curetted, and the outer plate of the skull was entirely removed. The bone was honeycombed in many places; the cancellous tissue was soft, gelatinous and full of pus. A small island of the outer plate was left over the left ear, and one near the midline at the crown. In several areas the inner plate was so thin the pulsations of the brain were transmitted through it. The incision was not sutured, but was packed with gauze saturated with a 1:10,000 solution of bichloride of mercury. This was kept well saturated continually and was repacked daily. Recovery was uneventful.

The temperature ranged from 98.3 to 99.4 F., and the pulse rate from 80 to 100. The patient was out of bed on the third day. He was discharged from the hospital on the fifth day. On the tenth day, when the infection seemed to be well under control, sutures of silkworm gut were placed in the outer ends of the incision and the counter incision in the temporal region. This was done for cosmetic results. These sutures were tied with a double straight knot, and each day were drawn tighter. After three weeks, both ends of the incision were healed perfectly; the juncture of the three incisions was then the only open area. Small pieces of sequestrum were removed from the midline incision about four weeks after operation. The incision was entirely healed by October 30. The patient is now gaining in weight, eating well and, barring headache at times, is in excellent condition.

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# Progress in Otolaryngology

## A Summary of the Bibliographic Material Available in the Field of Otolaryngology

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## TONSILS AND ADENOIDS

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In reviewing the literature for 1929 on the tonsils and the adenoids, I have selected only those papers which promote discussion and those which, according to my judgment, show the advances made in this particular field of otolaryngology during the past year. A great deal of interest on the subject of rheumatism and arthritis and their relation to the tonsils and adenoids has been shown in several interesting papers. Kaiser, who has made extensive studies of rheumatism in a large group of cases extending over a period of several years, continues to report the results of these observations. Waldapfel, Claus and others have continued their investigations on the subject of postanginous pyemia and report further studies on the histopathology of the tonsils and peritonsillar tissues.

### GENERAL CONSIDERATIONS

Burnett and Piltz presented a series of 100 patients who, following some acute infection, were especially studied with reference to possible injury of the heart. None of these had shown any signs or symptoms of heart disease prior to the recent infection. No cases of scarlet fever, diphtheria or frank rheumatism were included, and none of these patients gave a history of rheumatic fever; twenty-eight furnished significant changes in the electrocardiogram. In twenty of these, symptoms and other signs of heart disease were lacking or confusing, and in only three of the twenty-eight were either heart signs or symptoms sufficient to indicate injury. Pathologic and clinical evidence support the view that in the course of many types of acute infection the tissues of the heart are injured. Clinical recognition of this injury is often difficult or impossible. The electrocardiogram offers a means of diagnosis in a sufficiently large proportion of these cases to render its more general employment worth while.

Of 413 rheumatic children observed by Wilson and his co-workers over a period of from one to ten years, 247 were subjected to tonsillectomy. Manifestations of infection recurred in 47.7 per cent and

appeared for the first time in 34.7 per cent of the treated children. In only 17.5 per cent was there no manifestation of rheumatism after the operation. In rheumatic children less than 9 or 10 years of age, recurrent attacks were frequent, whether or not tonsillectomy had been performed. In older children recurrent attacks became less frequent regardless of enucleation of tonsils. The age at which tonsillectomy was performed and not the fact of tonsillectomy appeared to be the significant factor in the incidence of nonrecurrence of infection after operation.

Two hundred tonsillectomies in cases of subacute rheumatism, infective arthritis, fibrositis, ostearthritis, neuritis and sciatica are reviewed by Pavey-Smith. He stated that a probable focus in the tonsils can be found in a large number of these cases. In selecting cases for operation, a history of tonsillitis associated with onset or recurrences is favorable in cases of infective (focal) arthritis, and to a lesser extent in subacute rheumatism, in which such a history is commoner. The younger the patient, and the shorter the duration of disease, the better the prospects, but within very wide limits neither age nor duration is a bar to success. The bacteriologic evidence, though insufficient to convict *Streptococcus viridans* as the primary infective agent in chronic focal arthritis, increases the suspicion under which this organism already lies. In subacute rheumatism the results are so good that the operation should become a routine part of the treatment, if only as a prophylactic against recurrences and later endocarditis. In cases of chronic focal arthritis, if the balance of evidence condemns the tonsils and they are completely excised, improvement may be expected in 80 per cent of cases.

The analysis of 439 rheumatic children made by Kaiser disclosed the following facts: The most susceptible age for the first attack of rheumatism is between 8 and 14 years. In nearly twice as many children in the community studied, the first attack of rheumatism developed when the tonsils were still present. Recurrent attacks of rheumatism occurred 10 per cent less often in children who had their tonsils removed after the first attack of rheumatism than in those whose tonsils were not removed. The incidence of carditis as a complication in acute rheumatism was nearly as frequent in children who had undergone tonsillectomy as in those who had not. Chorea occurred as a complication in acute rheumatism with equal frequency in children operated on and not operated on, but the association of carditis with chorea was less in children whose tonsils had been removed. Tonsils are the avenue of infection in many cases of rheumatism and bear a definite relationship to this disease. Their removal should be advocated in the rheumatic and potentially rheumatic child until more is known of the etiology of rheumatism.

Findlay and his co-workers concluded that preliminary tonsillectomy may possibly render a person less susceptible to rheumatic arthritis but

not to chorea. Preliminary tonsillectomy, or tonsillectomy performed early during the course of the infection, may possibly, in the case of arthritis, render the heart less liable to be attacked, but not so in the case of chorea. As, however, cardiac complications usually ensue during the first or second rheumatic manifestations, the operation, to be prophylactic, must be performed before the second attack. Tonsillectomy in the case of carditis following arthritis seems to have a beneficial effect on the progress of the disease, but not so in carditis following chorea. The evidence in favor of the beneficial effect of tonsillectomy in the case of rheumatic manifestations characterized by arthritis is, however, slight. The varying behavior in response to tonsillectomy of examples of the rheumatic infection characterized by chorea and by arthritis suggests the possibility of a different strain of the infective agent in these two types of the disease.

Clarke pointed out that the geographic distribution of *Ceratophyllus fasciatus,* the common rat flea of northern temperature climates, and rheumatic fever is so similar as to make it seem possible that the insect is in some way connected with the etiology of the disease. These similarities are those not only of geographic and local distribution but of temperature and humidity, temperature being the more important. Rheumatic fever does not enter through those conditions of the throat which seem to be caused by overcrowding and bad ventilation, such as occur in the public schools, but there may be an association with the inflamed throats which are caused by the access of drain and sewer gas into houses. Defects of sanitation may admit drain gas into dwellings, but they may at the same time admit the rat with its flea. However, the fact that the disease may occur without an inflamed throat suggests that it is the flea and not the gas which carries rheumatic fever.

Zikowsky stated that among 1,013 patients with scarlet fever, only twenty-three had previously undergone tonsillectomy. Whether this is due to the fact that persons whose tonsils have been removed are less susceptible to scarlet fever infections, or to the circumstance that only a small percentage of the population of Vienna undergo tonsillectomy could not be ascertained. Many of the patients whose tonsils had not been removed developed serious complications. During the first week the tonsils were usually red and swollen and showed yellowish strips or spots. Later, these swellings disappeared, but a sort of secondary scarlet fever developed in the form of the typical scarlet fever glands. If the vitality of the patient was much reduced and the organism was not strong enough to combat this second attack, such complications as acute nephritis and otitis media developed. Dangerous also was lymphadenitis, which frequently followed tonsillitis or peritonsillitis. A careful observation of the twenty-three patients who had undergone tonsil-

lectomy proved that the scarlet fever in these patients was usually milder and showed fewer complications. Conditions of the heart and arthritis caused by scarlet fever were nearly the only complications noticed in these cases. Zikowsky does not make a concluding statement concerning tonsillectomy. He expressed the belief, however, that the tonsils are an important factor in scarlet fever. He assumed them to be the depository of the scarlet fever virus, and probably also the portal of entry for the disease.

Tonsillectomy has been advocated not only to relieve symptoms referable to diseased tonsils themselves, but as a means of protection against subsequent infections. Schick and Topper have made the Schick test on every child who came to the hospital for tonsillectomy. They found a fairly large number of children who showed a positive reaction to the diphtheria test before tonsillectomy. Six months after tonsillectomy, 100 children were retested. In eighteen children the reactions still remained positive, and in eighty-two the results were negative; in eleven of the sixty-one younger children (6 years of age or less) the reaction remained positive, while in fifty it became negative; in seven of the thirty-nine older children (more than 6 years of age) the reaction remained positive, while in thirty-two it became negative. The authors do not advocate indiscriminate tonsillectomy. They are still emphatically in favor of immunization by toxin-antitoxin. However, there are two practical applications to be considered: (1) the recommendation of tonsillectomy in place of immunization with toxin-antitoxin for children with diseased tonsils who are sensitive to horse serum; (2) the recommendation of testing children who have been tonsillectomized six months or more previously before immunizing with toxin-antitoxin.

Aycock and Luther reported that in 497 of 714 cases of poliomyelitis, tonsils were present, and in 217, tonsillectomy had been done at some time prior to the attack of poliomyelitis. Figures from the Massachusetts department of public health show that of 10,098 school children examined, 3,281, or 32.9 per cent, had had tonsillectomy. The age distribution of the school children represented in these two sets of figures is not available for a more exact comparison, with regard to tonsillectomy, between school children in general and those with poliomyelitis. However, the percentage of cases of poliomyelitis in which there was a history of tonsillectomy is so near that of school children in general that the presence or absence of tonsils does not seem to influence the occurrence of poliomyelitis to any considerable extent. The interval elapsing between tonsillectomy and the onset of the disease in this group of cases corresponds to the incubation period of the disease as indicated by other evidence. This suggests that in such rare instances the setting up of infection by the virus of poliomyelitis is in some way associated with tonsillectomy.

LaMotte reported three cases of acute infectious mononucleosis and referred to others reported in the literature. The first patient was a boy, aged 5½ years, who had fever and enlarged cervical glands for four months. The tonsils were red, large and somewhat embedded. The white blood count was 14,500, with polymorphonuclears, 25 per cent; small mononuclears, 70 per cent; large mononuclears, 2 per cent; transitionals, 1 per cent, and eosinophils, 2 per cent. The tonsils were removed, but the temperature returned to normal only after a period of eighteen days. The second patient was a boy, aged 13 years, and the third a girl, aged 19 years.

Brown expressed the belief that infected tonsils act as definite foci in cases of toxic goiter and should be removed in all cases of this type. In a study of fifty cases, thirty were considered of the toxic type and required both thyroidectomy and tonsillectomy to relieve all symptoms.

Brooks examined a group of 15,000 school children to determine the incidence of ear, nose and throat defects. Tonsillectomy had been performed in 3,358, or 23 per cent; 175, or 5.2 per cent, showed poor results. Pieces of tonsils were still remaining in various parts of the tonsillar fossa. Injury to the soft palate resulted from scarring of the pillars. Snaring of the uvula also occurred in certain cases. In conclusion, Brooks made a plea for more painstaking operations on the tonsil and a more careful following of all operative work.

Barlow pointed out the value of barbital before local anesthesia. It neutralizes the toxic action of cocaine and procaine hydrochloride. From 5 to 10 grains (0.32 to 0.65 Gm.) of barbital by mouth are administered one hour before operation.

Evans reported a brief summary of his personal experience and observations based on approximately 6,000 tonsillectomies in which nitrous oxide-oxygen alone was used for the anesthetic and approximately 10,000 in which nitrous oxide-oxygen-ether was employed. The appetite usually returns more quickly, and there is less nausea and vomiting when no ether is used. For children under 3 years of age the addition of a trace of ether with a higher percentage of oxygen is recommended.

In a review of the literature, Drosler found only one case of unquestionable primary tuberculosis of the tonsil. He reported an instance of this condition observed personally in which the death of the patient from bronchopneumonia made it possible to demonstrate conclusively, by careful postmortem examination, that the tuberculosis of the tonsils was primary.

Delavan emphasized the necessity for a scientific investigation of the causes of hypertrophy of the lymphoid elements of the pharynx. He called attention to the common prevalence of this unpleasant and trou-

blesome complication and recommended that this problem be thoroughly studied from a scientific standpoint.

In the discussion of tumors of the tonsil, Dunn emphasized that primary malignancy is not as uncommon as it was formerly thought. Early diagnosis is important, and the tonsil or peritonsillar area should not be disturbed by puncture when symptoms of infection are absent. When biopsy is taken, the cautery should be used to excise the tissue. Although cautery excision of the growth is advisable, treatment in all cases should include roentgen irradiation.

According to Boyce, the majority of middle ear infections, frequently extending to the mastoid and internal ear and sometimes causing chronic deafness or fatal intracranial complications, develop as the result of inflamed and hypertrophied adenoid tissue in the pharynx. By obstructing the breathway and interfering with reception into the lungs, enlarged adenoid masses may actually reduce the opportunity for thorough aeration of the blood. This gives rise to early fatigue, congested head, sleepy eyes and aprosexia and may be a large factor in the production of severe neuroses, such as chorea and epilepsy. Adenoids may be the focus from which infections in other parts of the body arise, as is more frequently the case with the faucial tonsils; but because of their obscure situation, the adenoids may escape scrutiny in this connection.

Nelson made a clinical study of adenoids in adults. Of nineteen cases of demonstrable adenoids, twelve were of clinical importance. Ten per cent of ninety-five adults seen consecutively with chronic tonsillitis had adenoids. Tonsillectomy had been performed in six cases, without attention being given to the adenoids. Frequent acute rhinitis and nasal congestion without demonstrable infection of the sinuses were present in more than half of the cases. In twelve, nasopharyngeal hyperemia seemed at least partly due to infection of the adenoids, and in seven a discharge of an inflammatory secretion independent of sinusitis was present. Several patients had disease of the middle ear related to the adenoids. Adults should be even more carefully examined than children, and adenoidectomy should accompany other operations on the nose and throat when adenoids are found. The conception that they do not occur in a pathologic state in adults should be guarded against.

## ANATOMY AND PHYSIOLOGY

On the basis of his personal studies and a review of the literature on the topography and mechanism of the tonsils, Choronshitzky came to the following conclusions: The analage of the tonsils is developed in the interarcual tonsillar fossa under increasing positive pressure; thus concentric layers of the peritonsillar connective tissue result, which form the basis of the capsule in the deep-seated tonsil. The pedicle

tonsil, however, has no capsule. The last type of tonsil, therefore, cannot harbor a subcapsular abscess, and expulsion of its contents is far more than in the deep-seated tonsil. The double lobe of the tonsil is due to persistence of the embryonic intratonsillar fold, as von Hammar stated. The capsule caps the outer and upper surface of the tonsil, enclosing the fossa supratonsillaris. The fringe of the tonsil lies between the mucous membranes of the side wall of the pharynx and the interarcual fossa. It is due to this cap that the enucleated tonsil appears on frontal section shaped like an arabic 6. On its dorsal surface, the subcapsular abscess forms protuberance of varied size. Evacuation of chronic subcapsular abscesses is of far-reaching importance in various diseases of the tonsils. However, opening of a peritonsillar abscess with a stump hook by way of the lacuna is dangerous, and the result is doubtful. Recurrences after tonsillectomy are prevented only if the entire tonsillar fossa is enucleated.

Trotter made a study of the function of the muscular attachments of the tonsil, and from the results of this investigation his conclusions are:

> It has been observed by stimulation of the nerve endings or terminals in the mucous membrane of the fauces, the pharynx and the tonsil, that a reflex action occurs which effects the muscles adjacent to the tonsil. By means of the conjoined contraction of the muscles, associated with the tonsil which cross and intersect intricately, pressure is exercised upon the upper pole of the tonsil, causing this portion to move outward and slightly forward toward the median line of the fauces. Pressure is also exerted upon the tonsil laterally by means of the palatoglossus and palatopharyngeus muscles. The contraction of the tonsillopharyngeus muscle, which occurs simultaneously with the upper musculature, directs the movement of the tonsil inward and this causes the tonsil to tip. The traction caused by the plica semilunaris in the tonsillar excursion and deviation from the vertical plane affects the upper portion of the tonsil, which causes a mechanical eversion of the organ, producing a mechanical expelling action or disgorgement of the tonsillar pouches and crypts. By this method the tonsil throws off the excessive exudate, food particles, cellular débris and bacteria and frees the pouches and crypts of foreign material and promotes drainage.

### BACTERIOLOGY AND PATHOLOGY

Nabarro and MacDonald are convinced that streptococci isolated from the tonsils of persons with rheumatism do not differ materially from those isolated from the nonrheumatic person. This absence of difference fits in with the theory that there is no specific streptococcus which is the cause of rheumatism, but that the condition is due to a hypersensitiveness resulting from repeated small doses of toxin. The tonsil is probably one of the foci from which these toxins may be absorbed. For this reason, in spite of the lack of difference mentioned,

tonsillectomy in rheumatic cases is probably a valuable prophylactic and therapeutic measure.

During the six months from November, 1927, to May, 1928, Polvogt and Crowe made cultures from the interior of the tonsils and adenoids removed at operation in 100 selected cases. Patients with a history of repeated attacks of tonsillitis were selected for this study. More than 50 per cent were children under 11 years of age. Their object was to determine (1) the predominating organism deep in the crypts; (2) whether the organisms recovered from the tonsils in patients with some general systemic disorder (tonsillitis, arthritis or nephritis) differed in any way from those recovered from the tonsils in patients with local symptoms only (tonsillitis), and (3) the carrier state. It is well known that acute tonsillitis is due to the hemolytic streptococcus. They were interested in determining whether this organism was still predominant at the time of the operation—from three weeks to six months after the last attack of acute tonsillitis. The hemolytic streptococcus was the predominating organism grown in 91 per cent and the staphylococcus in 8 per cent. In one case no growth was obtained. There is no apparent connection between the predominating type of organism found in the tonsils and the clinical symptoms. The majority of these cultures were made during the winter months, and all were made between November, 1927, and April, 1928. More than 50 per cent of the patients from whose tonsils a hemolytic streptococcus was grown in pure culture were children under 11 years of age. The majority of those in whom a staphylococcus was the predominating organism were over 25 years of age. The average time between the last acute attack of tonsillitis and the tonsillectomy was one month. In eighty-one cases the hemolytic streptococcus was the predominating organism in both the tonsils and the adenoids. In eight there was a heavy growth of staphylococcus from both the tonsils and the adenoids. In ten there was a heavy growth of staphylococcus from the adenoid culture and a pure culture of streptococcus from the tonsils. A culture made by swabbing the surface of the tonsil is a reliable index of the predominating organism in the crypts.

Ramsay and Pearce stated that although much may be learned by an experienced observer from an inspection of the tonsils in situ, and from any history which bears on them, the standards of assessment as to their normality or otherwise have been somewhat arbitrary hitherto, and the personal factor must of necessity play a part in the examining physician or surgeon. They have tried to arrive at a more accurate estimate by means of direct puncture into the substance of the tonsil, with subsequent investigation of the aspirated material on lines which have been standardized. Of 158 tonsils examined by this method of puncture, from patients varying in age from 5 to 51 years, seventeen were found to be

sterile on culture. Streptococci were present in pure culture in 111 cases, and with other organisms in twenty-six cases. With fermentation tests 81.2 per cent gave reactions for *Streptococcus pyogenes* and 18.8 per cent gave reactions for *Streptococcus viridans* or *mucosus;* 56.5 per cent of the streptococci were facultative anaerobes, and 78 per cent gave a hemolytic reaction on hemoglobin agar. Diphtheroids were present in four cases; staphylococci in eighteen cases (three in pure culture); pneumococci in five cases (one in pure culture), and *Bacillus influenzae* in one case. One patient who showed staphylococcal infection of the tonsil was suffering from sties and from a pustular eruption on the ear. Should the tonsil be found to be infected, the organism can be tested against the patient's blood and some idea of the resisting power of the latter to the organism can be obtained. If the immunity of the blood is found to be impaired, removal of the tonsils is probably desirable, other things being equal. The uses and future possibilities of the method are discussed, particularly in relation to puerperal septicemia and to rheumatic carditis in children.

On the basis of a review of the literature and his personal study on twenty-five pairs of tonsils derived from tonsillectomies and fourteen pairs from necropsies, besides experiments on eleven rabbits, Brunner stated that under normal conditions the tonsils have a low iron content. Iron is more often evident in material obtained from necropsies than in tonsils derived from tonsillectomy. It is accumulated on the borderline between lymphatic tissue and the capsule, in the lymphatic tissue itself and also toward the outside of the follicle. Pigment without iron is found, on the whole, in the same place as pigment containing iron. Deposition of iron and pigment is most frequently due to resorption of a pathologic hemorrhage caused by trauma or an inflammation. It may also be associated with hemolysis occurring in the tonsils under certain conditions. Iron derived from the blood circulation is likewise deposited. Following intravenous injection of a small amount of colloidal iron into rabbits the iron is first deposited in the wall of tonsillar veins, then also on the wall of the capillaries. In this respect, they are to be distinguished from the lymph glands. However, as the endothelium of vessels in the tonsils is impermeable for colloidal iron and accumulation of iron in the reticular cells is thus prevented, the tonsils resemble lymph glands, but are at variance with the behavior of the liver, spleen and bone-marrow.

In a study of pathologic changes in tonsils, Wilkinson examined 10,000 pairs of tonsils, with special reference to the presence of cartilage, bone tuberculosis and bodies suggestive of actinomycosis. After a complete compilation of the data in the 10,000 cases, it was found that in 8,573 cases there was nothing of unusual interest. The only disclosures rela-

tive to pathologic changes were various grades of fibrosis, pus and ulceration. The remaining 1,427 cases represent that proportion of tonsils in which there were pathologic processes other than those due to the usual inflammation and pathologic change.

Wilkinson's conclusions in this most comprehensive work on the tonsils are as follows:

1. All tonsils show evidence of chronic infection, if the presence of leukocytes in the crypts and ulceration of the epithelium are an indication of infection.

2. In 14.27 per cent of tonsils there are pathologic changes of bizarre types.

3. In 11.21 per cent of tonsils there are cartilage and bone in various grades and proportions.

4. Cartilage occurs in relatively larger amounts than bone.

5. Chronic infection is a great and definite factor in the production of fibrosis.

6. Fibrosis is relatively increased in cases in which there is cartilage and bone.

7. Chronic infection is an inciting factor in the production of cartilage and bone.

8. Fibrosis increases independently of infection and in direct relationship to age.

9. Bodies similar to those found in cases of actinomycosis occur second in order of frequency in pathologic conditions of bizarre type in the tonsil.

10. Tuberculosis of the diffuse type has an incidence of 0.52 per cent, and is on the decline.

11. In 0.17 per cent of tonsils there is bilateral involvement with tuberculosis.

12. The percentage frequency of occurrence of cartilage and bone is increased in cases of diffuse tuberculosis of the tonsils.

13. Cholesterol can be seen in 0.63 per cent of tonsils.

14. Foreign-body giant cells and cholesterol are associated with each other in chronic degenerative processes of the tonsils.

15. Trichinae are present in 0.06 per cent of extirpated tonsils.

16. There is sufficient pathologic change of interest in the tonsils to warrant routine microscopic examination of removed tonsils.

Fetissow defined as sore throat (angina) any acute, nonspecific inflammation of the entire pharynx or of certain parts of it such as the tonsils. He also discussed the terminology of the various symptoms. On the basis of a brief review of the literature and his personal study of four cases, he contended that, theoretically, the most rational division would be into two groups. In simple or superficial catarrhal sore throat, an increased output of lymphocytes and leukocytes in the epithelium is seen, without causing, however, destruction of the epithelium; on the surface of the tonsils, an inflammatory exudate is formed. Their tissue is swollen and edematous. In parenchymal or lacunar tonsillitis, destruction of the epithelium is effected. Ulceration has occurred and the entire tissue of the tonsil is involved by destructive suppuration. In this group the old terminology conforms with the microscopic picture.

Waldapfel presented microscopic evidence in support of his contention that the importance of thrombosis of veins has been greatly over-

emphasized. Its occurrence is frequent, he stated, and may be found to a certain extent in any type of abscess. Examination in serial section was made of the tonsils of patients who had been suffering from peritonsillar abscess and in several cases, from lacunar tonsillitis. Waldapfel stressed the point that in spite of thrombosis and suppurative exudation into the vessels, all the patients have recovered and are now in good health.

Riecke reported three cases in which careful histologic examination of the tonsillar and peritonsillar tissue was made. He came to the conclusion that also in light and uncomplicated cases of angina, thrombophlebitis can occur in the peritonsillar tissue without causing manifest clinical symptoms or general sepsis. Such cases can occur with or without abscesses in the peritonsillar tissue. In one of the cases, peritonsillar abscesses had occurred, and complications in the kidneys and joints had been observed. These could be traced to changes in the blood vessels. The cases described show that a thrombophlebitis may occur which does not always produce threatening symptoms but which can be, if only temporarily, a cryptogenic source of infection which the organism, as a rule, can combat. Unknown factors may come into play. Why should inflammation progress in one case and not in another? The anatomic structure of the peritonsillar tissue appears to be not without significance. Gaps may be caused by protruding crypts or cones of lymphatic cells, which favor the propagation of a primary infection in the tonsil. Generally, however, the peritonsillar tissue is the first barrier, as can be seen by the increase and cicatricial change of the tissue. It must be emphasized that staining of the elastic membrane is especially adapted to, and imperative in, the detection of these changes. Changes of the vessels can thus be shown which otherwise cannot be found.

Burchardt published a report of pathogenesis of sepsis after angina based on observations in eleven necropsies, in ten cases in which the patients were cured and in five cases (bordering on sepsis) in which especially enucleated tonsils were available. In these five cases, she noticed perivascular infiltration. The lumen of the vessels was free. The lymph spaces were filled with cells and cocci. All patients showed swelling of the regional lymphatic glands. This perivascular infiltration was a common occurrence. It always started in the tonsil or tonsillar bed, and could be followed, in the eleven necropsies, macroscopically and microscopically, to the large veins. Here the lymph glands were always infiltrated and mostly matted together. In six cases, contact infection was found between lymph nodules and the venae faciales communes or jugulares, in the lumen of which a suppurative thrombophlebitis was encountered immediately adjacent to the diseased lymph glands. The walls of the vessels showed

inflammatory disintegration in all layers. The other five cases showed plainly adhesions between the infiltrated perivascular tissue and the walls of the vessels, partly to the bed of the tonsil. In one case, a destructive inflammation could be observed reaching to the media, whereas the intima was intact and the lumen empty. Uffenorde's theory is strengthened by the observation that the pathways of the tonsil are filled downward with cells, thrombotic masses, cocci, etc., especially since no proof could be adduced for a purely hematogenous process of propagation, macroscopically or microscopically. Isolated lesions of the intima were never observed. The main point in postanginous complications seems to be the formation of a more or less pronounced phlegmon which propagates perivascularly. The lymph channels are undoubtedly involved. If the perivascular filtrates reach the blood vessels, they do so at any site, either near the original focus or deeper, affecting the venae faciales communes or jugulares. Whether or not a thrombophlebitis develops is of secondary importance so far as the genesis is concerned. The divergence of Fraenkel and Uffenorde can be explained in this manner.

### COMPLICATIONS

Kleinert reported two cases of abscess of the lung following tonsillectomy. He called attention to the fact that the protective reflexes may be abolished under local as well as general anesthesia.

May, Thoburn and Rosenberger made a study of aspiration during tonsillectomy. With the use of iodized poppy seed oil 40 per cent, roentgenograms were taken at intervals during and after operation to determine the presence or absence of aspirated material. These investigations showed that the incidence of aspiration may be diminished by (*a*) the extreme Trendelenburg position; (*b*) constant and thorough removal of all pharyngeal secretions; (*c*) choice of types of anesthetic and operative technic which cause the appearance of a minimum amount of mucous secretions and hemorrhage, and (*d*) the use of a degree of anesthesia which at least in part preserves the irritability of the laryngeal and tracheal reflexes.

A study of the pathogenesis of pulmonary suppuration following tonsillectomy has convinced Harkavy that the greater amount of evidence is in favor of aspiration as the mode of production of suppuration of the lung following operations on the upper respiratory tract. In three of twenty-seven dogs that received, through the bronchoscope, 0.5 cc. of mixed cultures of bacteria recovered from the sputum of patients with abscesses of the lungs following tonsillectomy, abscesses with cavities developed; in one, pulmonary suppuration developed, and a fifth presented evidence of a healed suppurative process in the lower lobe of the left lung, or 14.8 per cent of pulmonary suppuration. If results obtained

in dogs may be translated to the conditions occurring in man, it is suggested that following aspiration of infectious material from the upper respiratory tract, the course of events is as follows: (1) pneumonitis; (2) necrosis and cavity formation; (3) healing or persistence of the primary abscess with the formation of secondary bronchiectasis.

Alessandri and Visani assumed that it is almost universally accepted that many infections of the internal organs originate from primary inflammatory foci often located in the tonsils. That a casual relation actually exists between the tonsillar infection and the lesions existing in other organs is proved by these facts: (1) the onset of the secondary infection following soon after the tonsillar infection; (2) the identity of the micro-organisms isolated from the tonsils with those found in the secondary focus, and (3) the marked improvement or absolute elimination of the secondary focus that frequently follows tonsillectomy. However, cases of suppurative pulmonary lesions arising in consequence of tonsillar infections are rare in the literature. The authors therefore reported five cases of gangrenous abscesses occurring in their medical clinic during the years 1922 to 1929 which seemed plainly secondary to a tonsillar inflammatory process. In these cases, neoarsphenamine effected a cure or considerable improvement. The infection may have reached the lung by any of these three routes: (1) through the trachea and the bronchi, by inhalation of infective material from the tonsils; (2) by the blood stream, and (3) by the lymph nodes. The lymphatic vessels coming from the tonsils empty into the deep cervical lymph nodes; these are connected with the supraclavicular lymph nodes, which in turn connect with the retrosternal, the paratracheal and the tracheobronchial lymph nodes. It may happen that germs from the diseased tonsils pass through the lymphatic chain to the peribronchial nodes. These, suppurating, may evacuate into a bronchus and thus infect the lung. Fusiform bacilli, and especially spirochetes, are the casual agents of the disease and not the secondary invaders. Finally, the relation between oral spirochetes and pulmonary gangrene is shown by the demonstrated production in animals of gangrenous abscesses of the lung as a result of intrabronchial injections of material from the oral cavity containing the aforementioned organisms. Since arsenic has a marked therapeutic action on spirochetal infections, though it has none on ordinary infections due to pyogenic bacteria, it is intelligible why there are many authors who report cases of pulmonary gangrene in which a cure was effected by intravenous injections of neoarsphenamine.

From the consideration of thirteen cases reported within the last two years, in nine of which death occurred, Claus pointed to the danger of infection. In many cases it may be due to penetration of the infected tonsil and the still healthy muscular tissue with the same needle on injec-

tion for local anesthesia, thus creating a new focus of infection. Claus also considered operation in an acute stage of tonsillitis dangerous, and advised that a period of four weeks be allowed to pass before tonsillectomy. In case symptoms of general infection are noted, immediate tonsillar mediastinotomy should be done, together with injection of vaccine. Ligation of the veins should go hand in hand with drainage of the connective tissue. Two patients in whom these interventions were done were saved.

Uffenorde gave detailed description of three cases of sepsis which were caused by infected tonsils. He also mentioned similar cases which are reported in the literature. He stated that patients in whom phlegmons and abscesses do not disappear after a short time should be sent to a special clinic. This applies also to patients who have attacks of chills and continued high temperatures.

Nussbaum discussed pyemia following the anginas from the standpoint of pathogenesis, anatomy, diagnosis and treatment. He emphasized the fact that a streptococcus infection may spread beyond the tonsillar region to the contiguous tissues, causing peritonsillar and parapharyngeal suppuration. It may invade the blood vessels, giving rise to phlebitis and thrombosis. Bacteria directly invade the vascular system causing bacteremia with pyogenic emboli or a toxemia of a pure septic character. He recommended surgical treatment at the earliest possible moment, aiming at the tonsils themselves, so to say, infected hinterland by enucleation, exposure of the venous field, ligation, removing of clots and total excision of infected vessels in addition to drainage of pus collections.

According to Waldapfel, postanginous complications appear: (1) as submucous complications, for example, peritonsillar abscess; (2) as disease of the lymph glands without injury of the wall of the pharynx, i. e., (*a*) a swelling or excessive enlargement or (*b*) an abscess with possible propagation toward the mediastinum, the base of the skull or the blood vessels; (3) as a direct penetration through the wall of the pharynx, namely, a parapharyngeal abscess with the possibilities mentioned under 2*b*, and (4) as a direct transmission of the microbes from the tonsil to the blood stream and their rapid distribution through the whole system. Viewed from the standpoint of therapy, cases of postanginous pyemia can be classified into two groups. Cases of the first group, with a tremendously rapid course, show no swelling of the neck and present the picture of a fulminating sepsis. It is entirely unknown whether a greater virulence of the microbe or a diminished resistance of the body, especially of the glandular apparatus, is to be taken into consideration. Cases of the second group are more localized, and show formation of abscess and swelling of the outer part of the neck. The

first group is characterized by an infection of the blood current, originating in the tonsil. The prognosis is bad, and the therapy thus far futile. For the second group, surgical intervention is indicated. The pharynx muscles and the pharyngeal fascia can be reached (1) from the anterior and posterior palatine arch or through the tonsil and (2) from the outside under the digastric muscle, by penetrating between the lower jaw and the pharyngeal wall. If the pharyngeal wall and the fascia have been penetrated by the inflammatory process the second route is the more successful one, because it meets the suppurative process and does not run after it and because it makes drainage possible at the lowest point, if intervention has come in time. This method, with possibly a preliminary preventive mediastinotomy in the neck after Marschik and preventive exclusion of the mediastinum of the thorax, is used in the Vienna clinic in the majority of cases. The resection of the thrombosed veins encountered in the operation is, naturally, always carried out. He also outlined the indications for mediastinotomy.

Schlittler stated that tonsillitis is generally considered a harmless disease from which the patient recovers in from five to seven days. However, occasionally serious complications arise which frequently result in the death of the patient. The author gave a detailed description of six cases. The reports show that serious complications are usually characterized by general symptoms rather than by local ones. If chills are observed on the third day and pneumonia or pyelitis is not suspected, the patient should be sent to a hospital. Chills and fever usually indicate septic pyemia. Other dangerous complications are pleuritis and bronchitis. The author also advised that the blood be examined because leukemia or agranulocytic angina sometimes complicates tonsillitis. At the best method of treatment, Schlittler advised surgical therapy. He asserted that chemotherapy and sero-immunology have not proved effective. Of twenty-eight patients with pyemia who were treated surgically, fourteen recovered. In consideration of the malignity of the cases, the author regarded this as a favorable result. He emphasized that in order to assure the success of an operation, it should be made as early as possible. For persons who frequently suffer from tonsillitis, he advised prophylactic tonsillectomy.

Ide reported a case of cavernous sinus thrombosis and meningitis following tonsillectomy. Eight days after operation the patient began to complain of pain in the right ear, and later developed a general headache and proptosis of the right eye. The patient died with typical symptoms of cavernous sinus thrombosis and meningitis. Ide brought up the question as to whether the use of the LaForce instrument could have been an etiologic factor by its crashing effect on the veins. The question of the introduction of infection by the injection of a local anesthetic

was also considered. The advisability of early enucleation of the eye and drainage of the sinus was also considered as a possible means of preventing a fatal termination.

Blood cultures were taken by Rubin and his co-workers from seventy-eight selected patients following tonsillectomy. All patients showed evidences of recent infections of the throat. Positive blood cultures were not obtained in any case.

Gorny has not found any mention in the literature of a case of peritonsillar abscess caused by a foreign body. He observed such a case. In a woman, aged 38, a peritonsillar abscess was opened, with only temporary relief. Gorny had observed a yellow spot the size of a pinhead on the left tonsil, about 0.5 cm. from the palatine arch. A bristle, 9 mm. long, presented itself as Gorny was investigating the surroundings of the pus collection with a closed bayonet forceps. Foreign bodies are common occurrences in the valleculae, or in the faucial or lingual tonsils, but not peritonsillar abscesses. The author reported a case of Professor Seiffert. Seiffert saw a boy, aged 12 years, who suffered from peritonsillitis. A bristle from a tooth brush, 3 cm. in length, was removed. The author expressed the belief that in similar instances tonsillectomy might be considered if there is a well founded suspicion of the presence of a foreign body which does not show itself on the surface.

Fetterolf reported a very interesting case of infection by *Brucella melitensis* var. *abortus* complicating tonsillectomy. Four hours after operation the patient had a chill and a rise in temperature to 105 F. Blood studies showed that the patient was suffering from a blood stream infection by *Bacillus abortus*. This organism has long been known to produce infectious abortion in cattle. This type of infection is little known among otolaryngologists. Since children may contract this infection by drinking milk, Fetterolf emphasized the importance of considering this disease in children who are not cured by operative procedures in the tonsils, adenoids and sinuses, combined with proper hygienic and dietetic measures.

Miller reported a case of facial erysipelas following tonsillectomy. He reviewed the literature very comprehensively and reported the view of many observers. The general belief indicates that facial erysipelas frequently begins in the nose, nasopharynx and pharynx and spreads to the face. The fact that the facial lesions usually begin at the mucocutaneous margin of the mouth or nose substantiates this point of view. In Miller's case there existed a definite starting point for the infection in the region of the fossa following the removal of the faucial tonsils. The mucous membrane lesion spread through the nose to the face.

D'Amato reported four cases of chronic gastritis which gave the syndrome of gastric or duodenal ulcer. The differentiation between the two conditions was made by roentgen examination. *Staphylococcus*

*aureus* was recovered from the duodenal contents. The author proved that the condition was caused by tonsillar infection. In all cases, tonsillectomy gave excellent results. Cultures made from the tonsils gave *Staphylococcus aureus*. The author found by experiments in animals that this staphylococcus causes lesions on the mucosa of the stomach. The author expressed the belief that *Staphylococcus aureus,* acting for a long time on the walls of the stomach and duodenum, may produce ulcers. He also stated that in all gastric disturbances careful examination of the tonsils is indicated, and that all cases of chronic gastritis associated with chronic tonsillitis may be cured by tonsillectomy.

### TREATMENT

Wagers conducted a study of 274 cases with reference to preoperative indication and postoperative results. Subsequent interviews and reports were obtained in eighty-four cases. No illness during one year or longer following operation was reported by thirty-seven patients. Illness of some description occurred in forty-seven. Sixty-three were definitely improved by operation and there was no improvement by operation in twenty-one.

Rackemann and Tobey reviewed 1,074 cases of bronchial asthma to determine the part played by focal infections and other disturbances in the nose, throat and teeth. In cases in which the tonsils and adenoids were infected, the percentage of patients "cured" and patients improved was not far different whether operations were performed or not. They found that the presence of foci bears little relation to the outcome of the asthma.

Thompson described an abortive treatment for peritonsillar inflammation in which he makes an incision early and inserts a rubber tube drain. He stated that resolution begins early, thus shortening the course of the disease and eliminating a great deal of the marked discomfort usually accompanying this disease.

Watt designed a new tonsil suture forceps which carried a suture through a round closed needle with no opening or slot to catch and tear the tissue.

Pearlman and Leshin devised a sharp guarded forceps for evacuating peritonsillar abscesses. The instrument is sharp-pointed, has sharpened edges and has a guard at a distance of 2.8 cm.

In a consideration of the surgical treatment of the tonsils, Tilley discussed the surgical aspects of developmental anomalies, tonsillar calculi and surgery and its relationship to the functions of the tonsils. He also discussed the tonsils as portals or carriers of infection in relation to such diseases as diphtheria, tuberculosis and chronic arthritis. He recommended radiotherapy as the method of choice in the treatment for

malignant disease of the tonsil. Among the various complications of tonsillectomy, hemorrhage and pulmonary sequelae were considered as the most important.

Trotter described the technic of nerve block in tonsillectomy. One hundred and twenty-six patients were operated on with satisfactory results. Quinine and urea hydrochloride is used in 0.5 per cent solution and 1 cc. is used in each tonsil. Epinephrine is used with the solution to secure vasoconstriction. This solution is used because it produces an anesthesia lasting several days and in some cases lasting as long as eight days. No sloughing or other untoward complications developed. One of the chief advantages of this method is the elimination of the usual postoperative discomfort in the throat.

Dutrow, in the consideration of the technic of tonsillectomy, advocated the dissection method as the one of choice. He recommended the submucous infiltration in preference to the deep injection. Bleeding can be satisfactorily controlled by clamping the descending palatine artery at the upper pole of the tonsil. He advised against the employment of nonsurgical substitutions such as electrocoagulation.

According to Poras, whose personal experience within the last few years covers more than 1,800 tonsillectomies, none of which had an unfavorable outcome, the tonsils are not of vital importance, and they can be removed at any time without danger to the patient. He stated that the tendency toward sore throats is a sufficient indication for their surgical removal. The preferred type of operation in children is according to Sluder's method; in adults, tonsillectomy is advised with a blunt raspatory. For the purpose of checking venous bleeding, the use of a hemostatic drug is advised, given locally by insufflation, subcutaneously or by intravenous injection. Arterial hemorrhage is stopped by ligature around the vessel. For alleviating the pain caused by the wound, tampons soaked with antivirus are allowed to remain for a short while in the wound cavity; they have proved most efficacious. If the operation is done on account of sepsis or a suggestion of sepsis, a favorable result can be expected only if not more than one or two chills have occurred and if ligation of the jugular vein is done coincident with the tonsillectomy. Care should be taken that the ligature is made as far down as possible below the phlebitic portion of the vessel; in this case, only operation may save the patient's life. Otherwise, the prognosis is almost invariably serious.

The roentgen treatment for enlarged and infected tonsils is discussed by Nystrom. Seventy-four patients were treated in 1928. He usually treated the two outer fields, measuring about 5 by 6 cm., with one half of a Holzknecht erythema dose, copper filter of 0.5 mm., current of 2.5 ma., spark gap of 46 cm., and Coolidge tube. If necessary, the

irradiation was repeated after a six weeks' interval, in exceptional cases three or four times. In the cases observed for from two to eight months, improvement was noted in thirty-two of the thirty-eight cases of chronic tonsillitis; decrease in the size of the tonsils was seen in two of four cases of simple hypertrophy of the tonsils in children, aged from 2 to 8. The author considered roentgen treatment in chronic tonsillitis best suited to patients with moderately enlarged tonsils with an uneven surface and crypts or pus plugs; in most of these patients noticeable improvement was attained, often complete cure. With tonsils greatly enlarged but not yet infected, and in simple hypertrophy of the tonsils, as seen especially in children, roentgen treatment is advised only when operative treatment is contraindicated.

Of forty-six patients with epithelioma of the tonsillar region who were given roentgen treatment by Coutard between 1920 and 1926, twelve (26 per cent) are still alive and free from cancer after an interval since the treatment of from eighteen months to seven years. Three of the twelve patients received supplementary treatment with radium; in one of the three patients a small cancerous lymph node was removed surgically. In three of the twelve patients palpable lymph nodes were absent; in five of them extensive enlargement of the lymph nodes was absent at the time of treatment. Four of them had had massive inoperable collections of enlarged lymph nodes extending from the angle of the jaw to the clavicle. Nine of the patients treated with success had had extensive lesions passing far beyond the tonsils and the palatine arches and infiltrating the velum, the uvula or the sulcus glassopharyngeus and the sulcus glossomaxillaris.

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# Abstracts from Current Literature

## Ear

OTOGENOUS SUBDURAL ABSCESS. L. RÜEDI, Monatschr. f. Ohrenh. **64**:3 (Jan.) 1930.

Rüedi reviews the literature and describes the clinical histories of five patients who came under his observation. The abscess resulted in all of these as complication of an otogenous intracranial abscess. In three patients the intracranial infection occurred through contact of the diseased bone and the dura mater. In one instance infection was carried into the subdural space through the blood. In three patients the subdural abscess was diffuse and of recent origin, whereas in two it was already circumscribed. The exudation into the subdural space occurs on the inner side of the dura. The arachnoidea is unusually resistant toward the exudate, and it is only after a long period of irrigation with pus that it becomes permeable. Organization of the subdural exudate is then effected and it becomes encapsulated through connective tissue and other adhesions. On the undersurface a partly exudative, partly hyperplastic, inflammation results. The brain, however, does not become involved. Clinically, in two patients the otogenous abscess was concurrent with marked symptoms of labyrinthitis, leptomeningitis and sepsis; in another patient, however, as a simple otogenous intracranial process without well defined symptoms. Differential diagnosis from a brain abscess is difficult. The meningeal symptoms, coincident with lack of pressure in the brain and chiefly the negative result of puncture of the brain, point to the otogenous abscess. Operative opening and evacuation of the abscess are the only hope for recovery in both cases.

EDITOR'S ABSTRACT.

THE PATHOGENESIS OF MIDDLE EAR CHOLESTEATOMA. STEURER, Ztschr. f. Hals-, Nasen- u. Ohrenh. **24**:402, 1929. (From the Transactions of the German Otolaryngological Congress.)

The author shows sections illustrating invagination of the membrana tympani (Shrapnelli) without perforation, but with the ingrowth of epithelium which becomes sacculated, encloses a cyst and desquamates, i. e., a primary cholesteatoma. Some of the sections shown are from a new-born infant, in which Prussak's space was still filled with mesenchyme. He believes the factors to be a constitutional tendency to: a local anatomic disposition, a squamous epithelial overgrowth and a local irritation, which may be an eczema of the external canal or an inflammation of the middle ear of such slight degree as to be unrecognized clinically.

"CLEARING" SPACES IN ROENTGEN PICTURES OF THE TEMPORAL BONE. KRAINZ, Ztschr. f. Hals-, Nasen- u. Ohrenh. **24**:415, 1929. (From the Transactions of the German Otolaryngological Congress.)

In acute inflammations two forms of change are found in roentgen pictures of the bone. The most common is veiling of the boundaries of the cells, associated with increasing defect apparently due to absorption of the cell walls, but with retention of the clearcut margins of the defect. If operation is performed in such cases, rarefaction is found to explain the roentgen observations. If the condition heals without operation, eventually the bone shadow returns to normal, but with changed structure. Less frequently one finds clearing spaces which are ill defined and which enlarge eccentrically, but with diffuse margins. If they heal without operation, the shadows return to normal, without any apparent structural change. The author undertook histologic studies to determine what caused this apparent

resorption, but found no changes in the bone that he could demonstrate. Histologically, by staining methods the "clear" regions appeared the same as bone which gave a good shadow, and the calcium content appeared the same. He says that since this is unexplained one should accept with caution the diagnostic import of such diffuse clear areas.

BACTERIOLOGY OF FETID ACUTE AND CHRONIC SUPPURATIVE OTITIS MEDIA. L. HOFMANN, Ztschr. f. Hals-, Nasen- u. Ohrenh. **24**:423 (Oct. 1) 1929. (From the Transactions of the German Otolaryngological Congress.)

Fetor in acute primary otitis in childhood is more frequent than is usually accepted. Such cases have a tendency to chronicity.

A bacteriologic investigation showed that obligate anaerobic saprophytes were responsible in only a few cases. The majority of organisms were aerobic saprophytes, mostly of the group of Coryne pseudodiphtheria; others were *Proteus communis, pyocyaneus fluorescens* and *coli.*

In chronic otitis the Coryne pseudodiphtheria group played an important rôle; however, an equally important rôle was played by the obligate anaerobes. In the acute cases the saprophytes were recovered from the pus in the canal. The pus from the mastoid on which operation was performed showed only pyogenic bacteria, mostly streptococci.

Treatment with peroxide was disappointing. More success was obtained with astringents (formol, lysoform), and in cases in which *pyocyaneus* was found, 5 or 10 per cent silver nitrate was used. Dry treatment with pulverized boric acid, after cleansing, was the most successful. Diphtheria antitoxin was without effect.

DEMONSTRATION OF RADICAL MASTOID OPERATION IN COLOR FILMS. W. UFFENORDE, Ztschr. f. Hals-, Nasen- u. Ohrenh. **24**:444, 1929. (From the Transactions of the German Otolaryngological Congress.)

Only two primary colors are necessary for radical mastoid operation. By using behind one objective a blue-green and behind the other an orange-red, and then projecting the two films through corresponding filters so that they coincide on the screen, fairly natural colors are reproduced. The author shows his chiseling operation after Schwartze-Grunert; in cases of poor pneumatization he uses the Stacke method. He then shows his method of localized colorization before and behind the prominence of the horizontal canal, with the ensuing nystagmus. Third, he shows his own plastic method, consisting of a large flap of the canal made by a long incision along the upper posterior part, laid downward, and a quadrangular small one of the concha. A glass funnel is used to hold the flaps and to render removal of the tampon painless.

OTONEUROLOGIC SYMPTOMS IN TEMPOROSPHENOIDAL LOBE LESIONS. K. GRAHE, Ztschr. f. Hals-, Nasen- u. Ohrenh. **24**:498 (Oct. 1) 1929. (From the Transactions of the German Otolarygological Congress.)

Twenty-one cases are analyzed in this report. The functional tests of hearing showed a slight loss for conversation on the side opposite the lesion; there was a slight loss of bone conduction for *a1* while the loss for *A* was greater; the low tone limit was qualitatively normal, while the upper limit showed a slight loss. There was a quantitative loss of hearing duration for low tones, especially on the side opposite the lesion. An exception was found in a case of tumor, which showed loss on the same side, with the greatest loss in the middle register.

The vestibular tests showed no characteristic spontaneous nystagmus or past-pointing, although these were present to some degree and in varying directions in some of the cases. Experimental nystagmus to the affected side was decreased in frequency; experimental past-pointing was more marked to the sick side. Spontaneous falling was more frequent to the well side; also, experimental falling was more marked to the opposite side.

EXPERIMENTAL INVESTIGATION OF VESTIBULAR INFLUENCE ON VASCULAR CHANGES. DE CRINIS and S. UNTERBERGER, Ztschr. f. Hals-, Nasen- u. Ohrenh. **24**:504 (Oct. 1) 1929. (From the Transactions of the German Otolaryngological Congress.)

Irritation of the vestibular apparatus causes a typical vascular reaction, shown by the increased volume of blood in certain parts of the body; in the authors' experiment, in the forearm.

The same reaction takes place from either ear, and whether cold or hot water is used for calorization. (This is contrary to Muck's theory that homolateral influence only is obtained.) If the vestibular apparatus is impaired, no reaction obtains with either cold or heat applied to that side. If both labyrinths are intact and are tested at the same time by double irrigation, the same vascular reaction occurs as with either side alone.

EXPERIMENTAL INVESTIGATIONS OF THE QUESTION OF THE INFLUENCE OF DIABETES ON THE COURSE OF ACUTE OTITIS MEDIA. HESSE, Ztschr. f. Hals-, Nasen- u. Ohrenh. **24**:512 (Oct. 1) 1929. (From the Transactions of the German Otolaryngological Congress.)

Some authors believe that anatomic considerations and local disposition of the tissues, regardless of the presence of diabetes, are the determining factors in the onset and course of infection; others take the view that diabetes provides the underlying cause. The author removed the pancreas from a number of dogs, using normal dogs as controls. A number of the dogs on which operations were performed died despite the administration of insulin, but a number survived and were used. Cultures of hemolytic streptococci were injected into the tympanum. Protocols of both the diabetic animals that survived long enough and the controls are given in detail. Although the number of animals was few, the author concludes that so far as these evidenced, diabetes shows an unfavorable influence on the course of the infection. It even appeared to be the underlying cause that permitted the onset of the infection.

NYSTAGMUS IN RABBITS PRODUCED BY ELECTRIC STIMULATION OF THE BRAIN STEM. A. BLOHMKE, Ztschr. f. Hals-, Nasen- u. Ohrenh. **24**:520 (Oct. 1) 1929. (From the Transactions of the German Otolaryngological Congress.)

In a former work the author found that electric stimulation of the surface of the thalamus at the point where it merges with the anterior corpora quadrigemina produced nystagmus. The reaction was not immediate, and was prolonged after the stimulation was discontinued, which indicated that the irritation was not applied directly to a nucleus, but operated through a neuron system. The two questions for which answer was sought were: What was the nature of the physiologic stimulation? Over what pathways is it carried from the thalamus to the nuclei of the eye muscles?

As to the first question, at present it can be said only that the thalamus (in rabbits) has some relation to the vestibular nuclei; only nystagmus of the labyrinthine type is evoked. In regard to the pathways, the author followed the method of Lorente de Nó, who showed that the posterior longitudinal bundle was not the only pathway from the vestibular nuclei to the nuclei of the eye muscles, but that a considerable part was taken by the short fiber and cell system of the formatio reticularis, and that both components are influenced in this system; in fact, it may represent the supranuclear center governing the quick phase. Section of the posterior longitudinal bundles did not stop the experimental nystagmus. Section between the thalamic and the oculomotor centers did not stop it. Sagittal section of the brain stem, cutting the cross fibers of the formatio reticularis, interrupted the reaction. The author therefore argues the probability that the impulses go from the thalamus caudalward, are worked over in the formatio reticularis in the midbrain and pons and go forward to the oculomotor centers; also that the thalamus represents the most oralward of the neuron system for the production of

nystagmus, which neuron system extends through the medulla, pons and midbrain. In this system the higher functions lie in the oralward, the lower in the caudalward nuclei.

LEWY, Chicago.

## Larynx

FURTHER HISTOLOGIC INVESTIGATIONS OF CHONDRITIS AND PERICHONDRITIS OF THE LARYNX, AND THE SIGNIFICANCE OF DYSPNEA IN THIS DISEASE. SEIFERTH, Ztschr. f. Hals-, Nasen- u. Ohrenh. **24**:555, 1929. (From the Transactions of the German Otolaryngological Congress.)

The author describes in detail histologic pictures of inflammation and repair in cartilage. Usually repair is only partial and takes place through fibrous tissue, which may undergo some calcification. Cartilage but not bone may be melted down directly by pus cells without granulation tissue. His clinical observations are that the dyspnea of this disease is dangerous, leading to death unexpectedly, which he attributes to inhibition of the breathing center by irritation of the vagus rather than to carbon dioxide poisoning. For this reason and because of better healing, Seiferth urges early tracheotomy and cleaning out of the inflammatory areas. Conservative treatment is suitable only in cases of mild dyspnea. Healing under conservative treatment rarely occurs, and is not to be counted on.

LEWY, Chicago.

## Nose

RETROBULBAR OPTIC NEURITIS. FEIGENBAUM and SALZBERGER, Klin. Monatsbl. f. Augenh. **83**:657 (Oct. 7) 1929.

Feigenbaum and Salzberger reported on their study of twenty-four cases of retrobulbar optic neuritis; nineteen of the cases were of nasal sinus origin and in sixteen operations were performed. In the sixteen operative cases no gross or microscopic changes in the sinus membrane were found. The authors felt that a much higher percentage improved after operation and they advised opening the ethmoids and sphenoids.

In the discussion Thiese mentioned that multiple sclerosis and toxic forms must be differentiated from the rhinogenous forms.

Meesmann reported experiences at the Berlin Charity Eye Clinic where in more than 100 cases seen in the last ten years, the classic outcome from endonasal treatment could be found only twice.

Scheerer felt that the further clearing up of the question of rhinogenous retrobulbar optic neuritis of nasal sinus origin is to be expected from a systematic ophthalmologic study of all cases of nasal sinus disease, cases of ambulatory neuritis being sought, and secondly a systematic follow-up of operative cases to determine the later appearance of multiple sclerosis.

Steindorff advised against delay in treatment. He felt that Herzog's so-called "Daueranemia" was of great help in the differential diagnosis of these cases.

Weill reported four cases of retrobulbar optic neuritis which healed without surgical intervention. He divided his cases into two classes, the first class consisting of those cases with a rapid loss of vision in young people, especially women, in whom the changes in the eyes were unilateral. In this group the recovery of vision usually occurred without any intervention. The retrobulbar optic neuritis is the first sign of multiple sclerosis. In the second class he presents the atypical cases, often bilateral, which develop at any age and are of slow progress. He felt that this is the group of nasal sinus origin in which surgical treatment is indicated.

In closing the discussion, Feigenbaum stated that from his pathologico-anatomic studies, he agreed with Herzog's theory of the direct spread of the infecting agents through the marrow spaces of the bone. Feigenbaum stated that he used Herzog's "Daueranemia," often with good therapeutic results, but he felt that operation should be performed in the severe cases.

CONCERNING RHINOGENOUS RETROBULBAR NEURITIS. A. CAR, Klin. Monatsbl. f. Augenh. **83**:825 (Dec.) 1929.

Car, at a meeting of the Oto-Neuro-Ophthalmological Society held in Zagreb, reported that in 28,000 patients seen in the eye clinic at Zagreb, there were 12 cases of retrobulbar optic neuritis of nasal sinus origin.

Nasal sinus origin could be assigned to these cases for the following reasons: (1) In such cases no other etiology could be found. (2) The patients promptly improved after therapeutic intervention. (3) One could find pathologic changes in the sinuses even though the clinical examination was negative.

HARRIS H. VAIL, Cincinnati.

## Miscellaneous

ABSCESS IN TEMPORAL LOBE, COMPLICATED BY MENINGITIS. A. REJTÖ, Monatschr. f. Ohrenh. **64**:44 (Jan.) 1930.

Rejtö was able to record the unusually complete history of a patient, aged 36, in whom the abscess formed during two weeks of acute exacerbation of chronic otitis media. Two operations were performed in which considerable quantities of pus were removed. Examination of the spinal fluid done every second day did not disclose bacteria. Symptoms of meningitis occurred, and ten days later the spinal fluid was seen to contain streptococci. The condition of the patient remained severe with a concurrent endocarditis. The temperature, however, gradually dropped, and recovery ensued.

RELATION BETWEEN TONSILS AND TRACHEOBRONCHIAL LYMPH NODES. I. HOFER, Monatschr. f. Ohrenh. **64**:50 (Jan.) 1930.

From a clinical and roentgenologic study of 174 children with hypertrophy of the tonsils necessitating operation and 100 children without enlargement, Hofer concludes that there is no connection between tuberculosis of the tracheobronchial lymph nodes and hypertrophy of the tonsils. He does not favor the theory propounded by many authors that enlargement or tuberculosis of the tracheobronchial lymph nodes with coincident hypertrophy of the pharyngeal tonsils is due to a descending infection of the lymphatic system. Hypertrophy of the pharyngeal tonsils is related to tuberculosis in children so far as inhibition of nasal breathing leads to a chronic bronchitis, which, according to statistics, is responsible in 95 per cent of all cases for concurrent infection by tuberculosis. Very few cases are known in which tuberculosis of the pharyngeal tonsils is primary to tuberculous lymph nodes. In four fifths of Hofer's cases hypertrophy of the pharyngeal tonsils was coincident with an enlargement of the cervical lymph nodes. Hypertrophy of the palatine tonsil was almost invariably attended by hypertrophy of the cervical lymph nodes. Enlargement of the cervical glands without hypertrophy of the tonsils may be referred to scrofula and lymphatic diathesis. If indications for adenotomy, tonsillectomy or tonsillotomy are given, these operations should be done, according to Hofer, in spite of a positive cutireaction for tuberculosis and a positive roentgen examination. The effect of the operation is invariably favorable on the pulmonary condition and may be continuous. EDITOR'S ABSTRACT.

DIAGNOSIS OF STRIDOR IN THE AIRWAYS FROM VARIOUS SOURCES. VAN GILSE and KAISER, Ztschr. f. Hals-, Nasen- u. Ohrenh. **24**:530, 1929. (From the Transactions of the German Otolaryngological Congress.)

The authors define stridor, for their purpose, as a noise due to obstruction anywhere in the airway, which can be heard by the unaided ear without direct contact with the patient's body. They except asthma and the asthmatic wheeze from this definition.

The various obstructions and their results are:

1. Foreign body in the glottis: Marked airhunger; voice markedly interfered with; sometimes inspiratory stridor, but often no difference between it and expiratory stridor; severe cough in beginning; auscultation of larger airways shows the sound loudest at larynx; bronchitic râles in both lungs equal; weakened breath sounds bilateral.

2. Foreign body in subglottic space: Voice weak but clear; airhunger according to size of obstruction; stridor more often inspiratory; cough even though not severe is persistent; heard loudest at larynx, and can be distinguished from voice sounds made at same time (body in larynx, auscultation sounds cannot be separated from voice if voice is heard at all); auscultation of lungs as in 1.

3. Foreign body in trachea, but not near entrance to bronchi: Voice unchanged; auscultation sounds loudest at site of obstruction but heard over all the airways; after initial cough, no cough, and airhunger only if obstructing body is large; lung sounds somewhat weak but bilaterally equal.

4. Foreign body movable in trachea: Airhunger variable, most when body is near glottis; loudest point of stridor changeable; while body is fixed in position cough subsides, at other times cough is paroxysmal; while the body obstructs one bronchus breathing may be weaker on one side than the other; a "flopping sound" may be noticed by the patient or heard on auscultation of larger airways.

5. Foreign body fast in entrance of one bronchus, usually the right: Unless the body is large enough to overlie both bronchi, or part of the trachea, airhunger is not great; stridor both ways; cough minimal; auscultation sound louder as one approaches (posteriorly) the midline; sometimes a sudden lessening of the auscultation noted over the airways compared to that over the foreign body, which is also usually of higher pitch. Changeable sound here denotes some movability. Weakened breath sound over the entire lung of the obstructed side if the foreign body does not reach the entrance of the upper lobe bronchus.

6. In deep seated foreign body weakened breathing principally in the obstructed portion of lung; râles usually high pitched and localized.

These signs are clearest, of course, in the beginning; later secretion complicates them, but seldom covers them up entirely; more often balls of secretion may suggest multiple foreign bodies. The changeableness of the râles suggests their origin. Auscultation should be done over the glottis and trachea, along the spine and outward over the larger airways.

The authors also made a study by means of a diaphragm against the abdomen, which was connected with a kymograph and at the same time a nasal olive to conduct the respiratory sound, and report in detail the observations in a number of clinical cases. They hope by this method to establish characteristic graphs for various conditions.

TREATMENT FOR DYSPNEA IN ASTHMA BRONCHIALE. ELSE LEVY, Ztschr. f. Hals-, Nasen- u. Ohrenh. **24**:572, 1929. (From the Transactions of the German Otolaryngological Congress.)

The author presents a sleeping bag which encloses the body like an oxygen tent, with a filter to keep out all allergic substances from the inspired air. The bag opens and closes by a zipper contrivance. The bag is easily transportable and gives plenty of room for movement.

LEWY, Chicago.

# Society Transactions

## CHICAGO LARYNGOLOGICAL AND OTOLOGICAL SOCIETY

*Regular Meeting, Dec. 2, 1929*

SAMUEL SALINGER, M.D., *President, in the Chair*

INCIDENTAL MASTOIDITIS. DR. EDWIN MCGINNIS.

Upper respiratory infection may be a very simple affair, evidencing itself as only a simple nasal cold of about a week's duration, or it may be more serious, and its progress through the body may reach into many distant regions.

Mastoid infection may be the end-result of an acute coryza or tonsillitis, and if the infection is limited to one or both sides, its cure may be accomplished by a simple mastoidectomy. This is a happy end-result, because the patient's pain is usually relieved by the excision of the infected cells and the leukocytosis subsides, the temperature comes down to normal and the end-result is satisfactory.

Occasionally a patient is seen who has the classic symptoms of mastoiditis, and if operation is performed there is not the happy return to normal health. An early contact was obtained with such a patient who had had a mild case of tonsillitis, then a one-sided otitis media and later a mastoid involvement. Early myringotomy started the ear draining and the patient seemed better for a time, but soon he developed a rather high temperature, was dizzy and then had nausea and vomiting. A diagnosis of abscess of the brain was made. Later a cerebellar abscess was opened and drained on the side opposite to the infected ear and mastoid, and the supposition was that the abscess had its inception in the tonsillitis, and that the mastoiditis was incidental to the primary tonsilar infecton.

This incidental infection of the mastoid is more clearly illustrated by the following case in the practice of Dr. W. W. Wilson: Miss G. G., aged 24, of Aurora, Ill., had an acute coryza, beginning about March 10, 1929. This was followed by pain in the left ear. Examination at that time by Dr. Wilson showed tympanic congestion, but no bulging. The temperature was about 100 F., but the patient appeared more ill than the clinical observations indicated.

On March 12, under nitrous oxide anesthesia, a red and bulging drum was opened by Dr. Wilson, and a thin greenish pus was emptied out of the middle ear. Short chain streptococci were found in this pus. From March 12 until March 28, she ran the course of an acute otitis media, with the temperature not going above 101 F.; she seemed to be getting better, but on March 28, had a chill, and the temperature rose to 105 F. On this date she entered St. Charles Hospital, and on April 2, her temperature reached 107.4 F.

There was moderate tenderness over the mastoid, and the ear was draining a serosanguineous fluid. Dr. McGinnis examined her on March 30, and at that time her white cell count had dropped from 10,850, on March 29, to 6,500. On March 31, it dropped to 5,300. It was thought best to delay surgical intervention on the mastoid until after a blood transfusion, which was done on April 1. At the examination on March 30, he felt sure that she was suffering from a general sepsis which had its entrance through the nasal cells, because she had painful cervical glands on both sides and appeared more ill than the mastoid observations indicated. The question of lateral sinus infection and thrombosis was discussed at this time.

On April 2, Dr. Wilson and Dr. McGinnis did a simple mastoidectomy and as the wall of the sinus looked perfectly normal it was left alone. The patient made an uneventful recovery from the operation, and the mastoid wound drained and healed in about four weeks.

From April 2 to 23, she ran a septic temperature, the maximum being 107.2 F., with numerous chills. On April 15, she complained of severe pain in the left iliac region. Heat and flexion of the left thigh on the abdomen relieved the pain. A palpable and tender mass could be outlined in the left iliac region. On April 23, under nitrous oxide anesthesia, a left muscle splitting incision was made, and a large amount of thin, bloody, purulent material was drained from this region. Bacteriologic examination of this discharge showed short chain streptococci. A rubber drainage tube was inserted and the patient made an uneventful recovery.

But this was not the end, for she continued to have fever up to 104 F., from April 23 to May 20.

On May 15, the patient developed a severe pain over the region of the right kidney, and mild chills, not similar to those of the onset. On May 21, an incision was made along the border of the lower rib postperitoneally, and the perirenal space was explored. No pus was found, but the patient commenced to improve following this procedure.

A second blood transfusion had been given on May 10. The temperature finally became normal about May 29, and had remained normal since.

The patient was discharged from the hospital on June 1, and made an uneventful recovery, without symptoms. She had gained about 30 pounds (13.6 Kg.).

Dr. McGinnis' first impression on examining this patient was that she had more than a mastoid infection; in other words, general sepsis, and he thought that the ear was not the only point of entrance, because the jugular vein on that side was not tender on palpation, and tender and painful glands were palpable on both sides of the neck. With this in mind, the lateral sinus and the jugular vein were not disturbed. He still felt that ligation of the jugular vein would have had very little helpful effect on the progress of the infection. He also wanted to eliminate shock as much as possible. He believed that the first blood transfusion was very helpful, in that it raised the white cells and carried her through the surgical intervention on the mastoid.

Dr. McGinnis' impression of this case was that the mastoiditis was just an incident in the general infection, and its elimination by operation was helpful in the cure.

He expressed his appreciation to Dr. W. W. Wilson for the chance of participating in this interesting and instructive case, in which they had the complete cooperation of the Brennecke Clinic and the St. Charles Hospital.

DISCUSSION

DR. C. W. HAWLEY: I volunteer the report of a case similar to the one reported by Dr. McGinnis.

A number of years ago at the Postgraduate Hospital I was consulted by a patient suffering from a neglected mastoid involvement on the right side. I performed an operation on the mastoid and for a few days the patient did well, but then an extensive abscess formed in the right shoulder. This abscess was opened and drained by the surgeon who referred the patient. A week later another abscess formed in the knee joint, which was also opened with a considerable discharge of pus. A prominent surgeon was called in consultation, and he said that everything possible had been done. The patient continued to lose weight and strength and I suggested giving vaccine, to which the others did not agree. Within a few days there was involvement of the ankle joint. An autogenous vaccine was then prepared, and 15 minims (0.92 cc.) was injected on each of three successive days. On the fourth day, the dose was reduced to 10 minims (0.6 cc.). At the end of two weeks, the abscesses had entirely healed and the one that threatened the ankle joint did not materialize.

I think that a patient suffering from any acute infection will stand larger doses of any medicine than he can stand in the course of a mild illness. Eighteen years ago I had an acute attack of facial erysipelas in which no vaccine was used, and two years later another, from which I recovered promptly following the use

of vaccine. There was a recurrence in a few weeks, which also responded to vaccine therapy in 15 minim doses on two successive days.

A patient with multiple abscesses in the neck also improved promptly under treatment with vaccine. I believe that one should not be afraid to use liberal amounts in desperate cases.

DR. JOSEPH C. BECK: I think that the point for discussion is the recognition of an infected lateral sinus that looks normal. The case Dr. McGinnis has described is a multiple secondary infection, which I think would have recovered without operation.

I recall a case at the University Hospital some years ago in which pneumococcic symptoms were very prominent, and this germ was thought to be responsible for the septic condition of the patient. The jugular vein was not painful, and there was nothing to indicate that thrombosis was going on, but the picture was so suggestive of a thrombophlebitic type of mastoid that operation was determined on and the patient made a good recovery. I think that from the standpoint of the otologist, knowing that the lateral sinus becomes infected easily, there is no harm in opening and treating it properly. This is far better than to allow the patient to develop a septic endocarditis or a septic infarct in the lung.

DR SAMUEL SALINGER: I saw a case in consultation with Dr. Sonnenschein. The patient was a young woman who had had a mild otitis media, with a discharge for only two or three days. Although there were no local signs of mastoiditis she developed chills and fever within five days, with a temperature of from 105 to 106 F. and after eliminating all other possible foci it was decided to open the mastoid, which was found to be absolutely normal. Exploration of the sinus showed that it also was normal. Nevertheless, the jugular vein was ligated and the patient made a prompt recovery. The case was evidently a direct blood stream infection by way of a small emissary vein, or else a mural thrombosis present was too fine to be detected. As noted, the mastoid and the sinus were grossly normal.

DR. EDWIN MCGINNIS: I do not think that the case was a lateral sinus thrombosis. Some years ago I saw a case in which a young woman had an infection around the lower incisors and developed an abscess that extended underneath the periosteum of the inferior maxilla. This area was opened and treated by gentle curettage, and cleared up nicely. In two or three weeks she came in complaining of fever in the afternoon, and pain in the left groin. Her temperature was 101 F. She was placed in the hospital, and with the help of a urologist a left-sided perinephritic abscess was diagnosed. An incision was made along the left lower border of the rib and a large amount of pus escaped. This abscess could not be determined on percussion or palpation because it was so deeply situated.

I have sometimes used vaccines in cases such as Dr. Hawley described, but in the case reported it was a nonsuppurative variety of bacteria. I agree that a mixed infection could exist without much change, because in sinus infections there can be marked involvement without much visible change, and the same might hold true of the mastoid.

HYPERPYREXIA (FATAL) FOLLOWING TONSILLECTOMY. DR. SAMUEL J. PEARLMAN and DR. SAMUEL SALINGER.

Following operations, major or minor, conducted under general anesthesia about the oral cavity or away from it, there has been noted what may be termed a syndrome of pallor and hyperpyrexia. These symptoms come on a few hours after operative intervention and occasionally result fatally, within from twenty-four to forty-eight hours. Postmortem examination, with few exceptions, has thrown surprisingly meager light on the cause of death. The most common observations appear to be cerebral congestion and mild internal and external hydrocephalus. As the cause of this syndrome is not known, there can be no rational preventive

therapy. It would seem best not to operate on any person, particularly a child, with a temperature above 99.2 F.

DISCUSSION

DR. ROBERT SONNENSCHEIN: The public and many physicians have come to believe that tonsillectomy is a simple and harmless procedure. The fact that so many tonsillectomies are performed throughout the country, so often by general practitioners, with few serious sequelae, is no doubt the cause of this erroneous belief. Many operators disregard the fact that serious if not fatal hemorrhages or other postoperative results such as infection of the throat and ears sometimes occur, but as long as they do not result fatally, physicians consider them as inconsequential results. They likewise pay too little attention to possible distortion and stenosis of the pharynx, due to excessive scar formation following the removal of portions of the anterior pillar, the soft palate and uvula, to injury to the mucosa of the posterior pharyngeal wall in the removal of adenoids, etc. One thing, however, has put the fear of God in them, and that is the unfortunate and occasional death which results from tonsillectomy.

Dr. Fetterolf, at the last meeting of the American Laryngological Association, presented an interesting case report in which hyperpyrexia followed tonsillectomy and persisted for a number of weeks. No etiologic factor was discovered for a long time, but *B. abortus* was finally found. This bacillus often infects cattle and produces abortion. The patient shortly afterward recovered. Dr. Fetterolf said that the best treatment for this condition is the intravenous use of mercurochrome-220 soluble, and expressed the opinion that in all cases of hyperpyrexia lasting for a considerable time, without other cause, this bacillus should be sought.

As demonstrated in this interesting paper, the exact cause of death is often not ascertainable even at autopsy. Either the changes are microscopic, so that they are not detected at the time of postmortem examination, or they are not even discernible when histologic examinations are made. Only recently Dr. D. J. Davis stated before this society that in many of the tissues decided changes take place even a few moments after death, so that one can readily see that when postmortem examinations are delayed a number of hours or even longer, the changes in the tissues may be such that the exact pathologic process responsible for death cannot be diagnosed.

It is impossible for me to throw any light on the unfortunate ending of some of these cases. The references show that a number of theories have been advanced. It is well known that acidosis occurs frequently after a general anesthesia in children and is often accompanied by very high temperature. Fortunately, most of these patients respond very well to the administration of alkalis and carbohydrates, so that they usually recover rather promptly. Should the acidosis, however, be very severe, coma might ensue just as it does in cases of diabetes. It seems to me that the theory of death based on the unstable nervous system in small children, together with some disturbance in the heat regulating center, may account for some of these fatalities. No blame can be attached to the operator if all reasonable precautions have been taken, such as a careful examination of the urine, the heart, the thymic region, etc., but one must ever bear in mind the possibility of grave postoperative results. Both the surgeon and the layman should recognize the fact that there is danger connected with any operation, and the mere fact that a certain type of operation is often performed does not obviate the possibility of serious and wholly unexpected results. Since there are inherent dangers in all operations, none should be advised unless a thorough examination and a definite history give clear indications for surgical intervention. Furthermore, all possible care in the performance of the operation and in the postoperative course is imperative. Then and then only can consciences be clear when these inexplicable and unfortunate things are noted after a carefully performed operation.

The essayists have rendered a great service in bringing attention to this series of cases.

DR. J. HOLINGER: In a recent number of the *Zeitschrift für Ohren, Nasen und Halskrankheiten* a number of similar cases were recorded. When death occurred, the parts around the tonsils were carefully dissected and it was found that in a certain proportion of the cases the large veins from the tonsils were thrombosed with septic thrombi. The thrombophlebitis progressed along the large veins to the cavernous sinus at the base of the brain. The connection from the tonsils to the sinus is short, and a thrombophlebitis in these regions is rather difficult to find. Recently, reports of ligation of the veins have been published.

I do not know whether after tonsillectomy the cavity should be swabbed with a strong antiseptic. I like to use peroxide, which has the double advantage of stopping the hemorrhage and of being a strong antiseptic that does not injure the tissues.

DR. ROBERT SONNENSCHEIN: I think that the explanation suggested by Dr. Holinger would not answer in these cases, for the first patient died within sixteen hours after operation and no infection could produce a septicemia and cause death in that time. In the *Montatschrift für Ohrenheilkunde und Laryngo-Rhinologie,* Waldapfel, who read a paper before the American Academy of Ophthalmology and Otolaryngology, in 1928, had an article in which he stated that dissections have shown that probably in many cases of tonsillectomy there is some thrombosis in the veins along the tonsils, but this did not cause pyemia.

DR. GEORGE W. BOOT: It is a well known fact that there is such a thing as heat stroke, but often nothing can be found post mortem to explain it. There is a septic temperature due to thrombosis of the peritonsillar plexus following tonsillectomy, and I have seen such a case at the Children's Memorial Hospital that persisted for several weeks, but the patient finally recovered.

Has anyone seen acidosis following the use of nitrous oxide as an anesthetic?

DR. OTTO STEIN: It was apparent that the tonsillectomy had nothing to do with the hyperpyrexia, for the condition is known to occur following various surgical operations anywhere in the body, particularly in cases of cleft palate in which postmortem examination has shown extreme hyperemia of the brain. I recall a case which followed a hypophyseal operation under local anesthesia. This was one of a series of eighteen cases, and resulted in death from hyperpyrexia within two days. The operation was very rapid and uncovered an enormous cyst. Through some mistake the incision was enlarged very rapidly, and a large amount of straw-colored fluid escaped. No attempt was made to enter the cyst, but within a few hours the patient developed a high temperature, which reached 107.5 F. before death occurred two days later. When seen on the evening of the operation, a strong odor of acetone could be detected on his breath. I think that possibly the fatal termination was due to the sudden release of pressure at the base of the brain, in the neighborhood of the heat-regulating mechanism.

DR. JOHN A. CAVANAUGH: I saw a case with Dr. Tydings in a young woman in whom hemorrhage developed following operation. She was taken to the Chicago Eye, Ear, Nose and Throat Hospital, and within six hours developed a temperature of 105 F., which persisted for two days and was accompanied by delirium. After the second day the temperature dropped to almost normal and remained there for twenty-four hours, when it rose to 104.5 F., where it stayed for about thirty-six hours and then subsided. Nothing was ever found to explain the cause. The patient recovered.

DR. J. GORDON WILSON: I have seen several cases of hyperpyrexia, but none associated with removal of the tonsils. Hyperpyrexia is divided into two groups: one coming on immediately after an operation and the other developing after some days. The first is due to disturbance of the heat-regulating mechanism, the delicate nervous mechanism which keeps warm-blooded animals at an even temperature. In such cases the operation, for an unknown cause, throws the mechanism out of action, comparable in some way to "shock," and the temperature rises abnormally. In some cases, on postmortem examination hyperemia of the brain has been disclosed, but in others no postmortem change could be demonstrated.

In the second group there is an abrupt rise in temperature later; it may be on the second or third day after the operation. This, I believe, is due to some toxic absorption.

In children, following an operation on the tonsils I have seen a rise in temperature which may be abnormally high, but in no case have I seen anything approximating a hyperpyrexia or a fatal result.

DR. HOWARD C. BALLENGER: In order to determine the question of bacteremia following tonsillectomy at the Sprague Institute of the Children's Memorial Hospital, a series of seventy-three blood cultures was taken by Dr. Rubin during and after the operation on the tonsils to see whether fever following tonsillectomy could be explained through bacteremia. In all seventy-three cases, the cultures proved negative. I think that it is apparent that a bacteremia does not have much to do with these cases, but due allowance should be made because of the difficulty of determining whether a bacteremia is present, especially a transitory bacteremia.

DR. NOAH SCHOOLMAN: I think that the adenoidectomy is probably as frequently implicated in these rare accidents as the operation on the tonsils. The vault of the pharynx is attached to the most vulnerable part of the base of the skull involved in this operation. On its cerebral aspect lie the medulla and the pons with the cranial nerves emerging from them. It is also in close proximity to the hypophysis. In intra-uterine life this portion of the basic cranii, the pars basilario, exists as a separate mass of embryonic osseous structure with loose cartilaginous attachment to the rest of the base of the skull. These conditions may persist indefinitely into infancy and childhood. Adenoidectomy is usually performed with massive instruments which exert considerable force on this portion of the cranii which may, under unusual predisposing circumstances, cause hemorrhage or other injury to the superimposed midbrain.

I call attention to the interesting work of Professor Levy of Berlin regarding the vascular and lymphatic relations of the adenoid and the hypophysis and the pathologic implications of such relations under some circumstances.

DR. ARTHUR M. CORWIN: Is there any clinical record of the treatment for hyperpyrexia in these cases?

DR. JOSEPH C. BECK: Referring to acidosis following the administration of nitrous oxide anesthesia, I shall cite a case in which this anesthetic was given to a patient on whom the physicians started to operate under local anesthesia. The patient was a woman, aged 60, who had difficulty in breathing because of a central thyroid gland. A local infiltration was performed with apothesine, the object being to do a tracheotomy to give room for breathing. After completing the infiltration and dissecting the gland freely, great difficulty was encountered in keeping the patient quiet, so nitrous oxide gas was given in order to expose the trachea. The patient breathed easily immediately, but promptly went into a condition of acidosis. Her breath was very strong, she vomited, developed all the symptoms of acidosis and died within a few hours. There were no symptoms referable to the lungs, and a postmortem examination could not be secured.

In the investigation of the condition of hyperpyrexia I hoped to hear something of the work of Vaughan, who did a great deal in the way of producing high temperatures by giving foreign proteins.

DR. SAMUEL J. PEARLMAN: The object of the paper was to call attention to a syndrome of high temperature, pallor and occasional death. Because of the few cases reported, it was thought to be an extremely rare condition, but judging by the cases cited in the discussion, it is evidently more common than I had believed.

The fact that thrombi are found in the tonsillar fossa following tonsillectomy had nothing to do with the condition, but minor operations under general and sometimes under local anesthesia do produce this syndrome. There is no agreement as to the cause, but I think that the suggestion of Dr. Wilson, that there was some connection with the heat-regulating mechanism, is to the point. The pallor is that associated with bulbar involvement. The patients with sepsis following

tonsillectomy usually survive for a number of days, and postmortem observations often indicate the cause of death and show, for instance, thrombi in the jugular vein. As to split proteins causing the condition, I think that no one can say.

The lesson to be learned from these cases is that no operation should be undertaken unless there is a very good reason for it.

FOREIGN BODY IN THE LUNG. DR. JOHN A. CAVANAUGH.

This case was presented because of the unusual location of a foreign body in the lung.

Mrs. E. S., aged 52, was referred because of a probable foreign body in the right lung, with the following history. While eating chicken at dinner the night before, she suddenly choked, gasped for breath and ran to the back porch seeking air; she stuck her finger into her throat, something gave way and she gradually regained breath and felt better. There was very little coughing but a slight pain developed in the right side of the chest. Convinced now that a foreign body was there she assumed various positions, almost standing on her head forward, hoping gravity might assist in getting rid of it. Finally a neighborhood physician was consulted who assured her that anxiety was needless, but not being satisfied she sought the advice of a throat specialist who examined her throat and also declared that there was nothing wrong. She returned home still feeling the discomfort, went to bed and passed a restless night; feeling a tightness in the chest she began to wheeze and feared that she had asthma. The following morning another physician was consulted who thought that a foreign body might be present in the lung. A roentgenogram was made which showed a rather long thin shadow in the right side of the chest and she was referred to Dr. Cavanaugh who saw her about 2 p. m. There were distinct râles over the right lung. The temperature was 99 F., the pulse rate, 100. Respirations numbered 24. The right vocal cord had on its upper surface a submucous hemorrhagic spot in its middle third. The balance of the larynx was a dusky red and the arytenoids were slightly edematous. He advised going to the hospital at once, but met with considerable opposition from the patient and her daughter. Mrs. E. S. cited a case reported in the newspaper in which a patient coughed up a screw after being held up by the feet and wanted to know if he could not hang her up by the feet and shake it out. After much controversy she went to St. Luke's Hospital. One-fourth grain (0.0162 Gm.) of morphine sulphate and $\frac{1}{200}$ grain (0.00032 Gm.) of scopolamine hydrobromide were given hypodermatically; applications of 10 per cent cocaine were made to the larynx and an application of 5 per cent cocaine below the glottis. Dr. Cavanaugh introduced a 7 mm. Brunning tube and when the right main bronchus was reached he could see a somewhat whitish mass on the anterior wall. Passing into the right bronchus he could see the foreign body lodged in the mouth of the middle lobe, and with a Jackson forcep he grasped the protruding portion and removed it. The size necessitated the removal of the tube at the same time. When the glottis was reached he turned the foreign body so the long axis would be with the long axis of the glottis and it slipped through without traumatizing. The object was a chicken bone 2 mm. long, 13.5 mm. thick at one end and 10 mm. at the other. The patient was removed to a croup tent where she remained for three days, making an uneventful recovery. When Dr. Cavanaugh saw her at the office a week later, a little redness of the cords remained; otherwise they were normal and the chest showed negative observations.

DISCUSSION

DR. EDWIN MCGINNIS: I saw a case in which a child coughed up a screw. Tucker told me that only about 2 per cent of the foreign objects in the finer bronchi were coughed up. I congratulate Dr. Cavanaugh on getting such a large object out between the cords without injury to them. Recently, a dentist, while attempting to fit a five tooth bridge to some prepared teeth, let it slip, and it landed in the right bronchus. It took a good deal of patience to slide it out between the vocal cords without injury to them.

DR. GEORGE W. BOOT: In the last three cases, in which I used bronchoscopic treatment, the patient coughed up the foreign body before I could reach it. I consider it a very serious matter to take out a large foreign body between the cords, particularly if it is larger than the tube. In a case seen recently in which a child had swallowed half a peanut kernel, the patient died before I could perform a tracheotomy.

FOREIGN BODY (DEPOSIT OF BARIUM) IN ANTRUM. DR. AUSTIN A. HAYDEN.

The patient was a school teacher who had been operated on for the removal of gallstones. Her nose and throat were examined before operation and were found to be normal. A few days after the cholelithotomy she complained of pain in the region of the right antrum. A roentgenogram revealed the presence of a foreign body. Investigation showed this to be a mass of barium that had lodged in the antrum when the patient vomited following a barium meal during the examination of the gastro-intestinal tract.

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## COLLEGE OF PHYSICIANS OF PHILADELPHIA, SECTION ON OTOLOGY AND LARYNGOLOGY

H. P. SCHENCK, M.D., *Reporter*

*Dec. 18, 1929*

GEORGE M. COATES, M.D., *Chairman*

REPORT OF A CASE OF SINUS THROMBOSIS PRESENTING SOME INTERESTING FEATURES. DR. BENJAMIN D. PARISH.

Seven weeks after exposure to scarlet fever and a protective inoculation of antiscarlatinal serum, a boy, aged 10 years, developed earache with a temperature of 104 F. An incision of the bulging left drumhead liberated bloody serum, but his condition was no better on the following day and operation revealed a hemorrhagic mastoid, the general appearance of the bone being that of an acute osteomyelitis. A pure culture of *Streptococcus hemolyticus* was obtained from the antrum.

After operation, the temperature dropped to 100 F., but within the next two days rose to 105 and 106 F. Blood cultures were negative. The internal jugular was ligated, and through the original incision the inner table of mastoid over the sigmoid sinus was removed; the sinus was found bathed in pus. The wall of the sinus was very dark and was firm to the touch. The clot was removed from the sinus.

A stormy period followed, with the temperature ranging from 105 to 100 F. Five days after operation the patient received 250 cc. of his father's blood without improvement. That night the father developed a streptococcic tonsillitis. One week after the sigmoid sinus was opened, the patient had the first chill and following the administration of 20 cc. of 1 per cent solution of mercurochrome-220 soluble, the temperature rose to 107.2 F. Eleven days after the first operation, the blood first showed a positive culture of *Streptococcus hemolyticus*. The following day, as skin tests were negative, an intravenous dose of antistreptococcus serum was given. Less than 5 cc. of serum, however, produced anaphylactic shock, and the patient hovered between life and death for twenty minutes, but revived under large doses of epinephrine and general stimulation.

The administration of mercury succinimide intravenously on the thirteenth day was followed by a chill and a rise in temperature to 108.6 F. On the fifteenth day, the father having sufficiently recovered from his tonsillitis, another transfusion of 300 cc. was given. Marked improvement followed. Three more transfusions

were given at intervals of two days, and a second dose of mercury succinimide was administered. Improvement was rapid from this time on, and the patient was discharged from the hospital with the wound healed one month and twelve days after admission.

Dr. Parish concluded that no chemical agents can be relied on to render an infected blood stream sterile, and that the real weapons of attack are repeated blood transfusions, supported by spirits of frumenti and arsenic, and that if it is possible to obtain the blood of a donor just recovering from the same type of infection, the surgeon may consider himself especially lucky.

DISCUSSION

DR. ALEXANDER RANDALL: The influence of the father's blood in this case is of extreme interest. While the matter of transfusion is frequently indicated, a suitable donor may not be available. In such instances the intravenous use of saline solution is of value. Elimination by the skin and kidneys lessens the septic condition of the patient. Blood from a donor in the recovering stage is certainly of great aid.

DR. CURTIS C. EVES: With temperatures of 107.4 and 108.8 F., I think that Dr. Parish should be congratulated in getting this patient well. The blood of a patient who has recovered from sinus thrombosis should be valuable for some time. However, there are many types of streptococci and the difficulty would consist in securing donors with the same type of streptococcic infection as the patient.

DR. ROBERT J. HUNTER: Dr. Igleton has advised taking cultures in desperate cases and vaccinating donors. Of course this takes time but as the transfusions go on the donor is developing his immunity to higher levels.

DR. GEORGE M. COATES: Dr. Igleton vaccinates donors from time to time against various organisms to maintain their immunity so that they are available as occasion arises. I performed a sinus thrombosis operation on a mother, and eight years later did the same operation on the daughter. The father's blood was not of value but one transfusion of the mother's blood ended the matter.

DR. JAMES A. BABBITT: One patient of Dr. Butler recovered because of the use of mercurochrome under Dr. Piper's direction.

DR. BENJAMIN D. PARISH: I was interested in bringing out discussion regarding chemical agents of value in infections of the blood stream. We used succinimide of mercury because in one of Dr. Fielding Lewis' cases recovery was felt to be due to this agent.

SYPHILIS OF THE TEMPORAL BONE, WITH ACUTE PNEUMOCOCCIC MENINGITIS: REPORT OF A CASE. DR. ROBERT J. HUNTER and DR. WILLIAM P. BELK.

In January, 1927, a man was picked up on the street unconscious and was brought to the hospital with no marks of identification. It was evident that he had a purulent meningitis with profuse purulent otitis. On brief examination, it appeared that his ears were the portal of entry. Examination of the spinal fluid showed 3,550 cells, 100 per cent polymorphonuclears, with a micrococcus in the smear. This, at once, made the case appear hopeless. But in view of the recent work of Dr. Kolmer and Dr. Eagleton, we determined to give the patient what small chances there were. We did a radical mastoid operation on the left ear, which appeared to be the worst, and having found no definite leads to the brain, after exenteration, we turned to the right ear, on which we performed a simple mastoid operation, having found that there was relatively no involvement, the inflammation being confined chiefly to the region of the middle ear. We then trephined over the posterior horn of the left lateral ventricle, inserted a needle into the cisterna magna and washed through and through. Another needle was inserted into the lumbar spine and lavage from this point to the cisterna magna was carried out. Physiologic solution of sodium chloride was used.

The patient improved wonderfully after the operation. Within twelve hours he was conscious and well oriented. We got in touch with his physician and found that he had been under treatment for syphilis. The patient did not take arsphenamine well; he had been taking bismuth. The history of the case was not available, but his physician had suspected an intracranial condition and had ordered him to go to the hospital. He was on his way there when he fell over on the street.

We performed lavage of the cerebrospinal system the second time and injected the formalin solution into the spinal canal. The patient did not improve with the second injection. Within forty-eight hours, we had a report that the gram-positive *micrococcus* first observed on the day of admission was the pneumococcus. The patient died on the same day.

Autopsy revealed a frank purulent meningitis, with thick yellow pus, covering the base of the brain. The appearance of the petrous bone was unusual. There was a bilateral, more or less symmetrical, involvement of the apex of each bone. The dura was gone and both bones were eroded and had a moth-eaten appearance. It was evident that this was the source of the infection and not from the usual mastoid area.

The bones were taken for sectioning, the Nagel method being used. This takes a year and with interruptions has taken us two years. The last sections have just come through. The slides are exceptionally fine and repay us for the time spent.

(Dr. Hunter then exhibited a number of sections of the temporal bone and brain, demonstrating the anatomy of the internal ear, the chronic lesions in the syphilitic areas and the acute invasion with the pneumococcus.)

DISCUSSION

DR. ALEXANDER RANDALL: Such work is carried out in few countries, and it is gratifying to see such work and such technical care in working out these delicate structures. The Mutter Museum is fortunate in having a great collection of such studies.

DR. BENJAMIN PARISH: We had a case seven months ago which was probably syphilitic, as this was, but we failed to obtain an autopsy. On admission the ears were running and there was evident meningitis. The Wassermann reaction was 4 plus. We operated, but the patient died in three days. The symptoms may have been due to cerebral syphilis or to brain abscess, independent of syphilis, and to the abscess of the ear. I do not know whether we were justified in looking for an abscess. Should we have regarded it as syphilis?

DR. STEPHEN WEEDER: I reported a case of meningitis. A playmate of the patient developed evident meningitis, with 3,000 cells in the spinal fluid. The recovery was complete in a week.

DR. ALEXANDER RANDALL: I always question about the pulse rate because in brain abscess few cases fail to show a decided slowing of the pulse. This is the most characteristic feature of brain abscess. The rate is slow even if meningitis is also present. I have seen thirty or forty such cases.

DR. EDWARD B. GLEASON: The number of cells is not of great consequence if no bacteria are present. Polymorphonuclear cells indicate an active process while lymphocytes indicate a more chronic process.

DR. ROBERT J. HUNTER: This patient showed no symptoms of brain abscess and no slowing of the pulse. The blood pressure was 140 systolic and 80 diastolic. A patient with a 4 plus Wassermann may also have an additional infection. One patient was referred for a differential diagnosis between lateral sinus thrombosis and cavernous sinus thrombosis. Erosion in the nose and blistering of the mucous membrane indicated syphilis and the Wassermann reaction proved to be 4 plus. The entire process subsided under antisyphilitic treatment. In another case it was thought that the facial palsy present was due to syphilis but the ear was found to be involved and following a mastoid operation the facial palsy cleared

up. The question that Dr. Gleason brings up is important. The decision only too often rests on the bacteriologic reports. Often several days elapse before the report is obtained and valuable time is lost. In one case showing 2,000 cells, successive taps were done and no organisms found. The patient got well with no other treatment than the spinal tapping.

ATRESIA OF LARYNX: A PROBLEM IN TREATMENT. DR. LOUIS H. CLERF and DR. EDMOND L. AUCOIN.

A man, aged 32, was struck across the front of the neck by a stick of wood, thrown by a saw, and knocked unconscious. An emergency tracheotomy was necessary the same day. At no time was it possible to decannulate, and the laryngeal airway became progressively smaller, ultimately closing.

On admission to the Chevalier Jackson Clinic, fourteen months after the injury, it was found that the tracheotomy cannula had been changed only once since its introduction. No air passed through the normal passages and the airway was completely closed. There were distortion and asymmetry of the larynx. A low tracheotomy was performed, but direct laryngoscopy revealed no laryngeal lumen, and a diagnosis of atresia of the larynx due to cicatricial changes secondary to perichondritis was made. The larynx was probably fractured at the time of injury.

Laryngostomy was performed one month after admission, and a new airway was established from below upward, keeping close to the right ala of the thyroid which was apparently the only remaining portion of the laryngeal cartilages. A gauze pack was introduced. The new laryngeal lumen epithelialized slowly but was complete in two months and a rubber laryngostomy apparatus was then introduced. The size of the apparatus was slowly increased. Six months after operation, the apparatus was removed for a test period and within a few days the lumen had contracted to one-fourth its original size. Similar results followed successive test periods, and it was concluded that the difficulty lay in the lack of support of the soft tissues of the larynx, since only a portion of the right wing of the thyroid cartilage and some small masses of cartilage in the region of the cricoid were found at operation.

It was planned to give lateral fixation first and then to bridge the gap between this by implants placed anteriorly and posteriorly. Two portions of rib, 8 cm. in length, were removed and one of these was placed in the soft tissues on each side of the neck alongside of and corresponding to the axis of the trachea and larynx. At the lower ends the grafts were in close proximity to the trachea; at the upper ends, the interval between them was somewhat greater. The airway was not entered. Healing took place by first intention.

The lateral splints have now been in place for six months. Definite support is given to the lateral walls but the anterior and posterior walls continue to encroach on the laryngeal lumen. It is planned to insert several portions of costal cartilage beneath the mucous membrane both anteriorly and posteriorly, the rib transplants being used as supports. This should provide a more or less rigid box for the larynx so that the patient will be able to resume breathing through the normal passages.

DISCUSSION

DR. JAMES A. BABBITT: Exactly what portions of bone were used? What prospect has the patient of a voice?

DR. EDMOND L. AUCOIN: The solid, bony portion was used with the periosteum intact. The patient has a buccal voice; there is no laryngeal voice.

FRONTAL SINUSITIS COMPLICATED BY OSTEOMYELITIS AND EXTRADURAL ABSCESS. DR. KARL M. HOUSER.

One week after a slight cold, from which he had apparently recovered, a university student, aged 17, was admitted to the hospital because of severe frontal

pain, malaise, nausea and vomiting. There was marked prostration together with a temperature of 103.4 F. and a leukocyte count of 21,000, 84 per cent of which were polymorphonuclears. Tenderness was elicited over both frontal sinuses and they were dark to transillumination. The antrums were negative. The middle turbinates and nasal mucous membrane were slightly swollen and congested. Streams of pus were present at the posterior ends of the middle meati and also in the spheno-ethmoidal recesses. Blood cultures were negative.

The patient became steadily worse in spite of general and intranasal medication. The swelling over the right frontal sinus became more marked, inflammation of the right eye, sufficient to cause some fixation of the bulb, developed, together with chemosis. The roentgenologist reported clouding of the left frontal sinus and haziness of the right, clouding of the left antrum, clouding of the right ethmoids and hazy sphenoids. The symptoms were more marked on the right so that, a week after admission, the anterior third of the right middle turbinate was removed, several ethmoid cells in the region of the nasofrontal duct were opened and the sinus was probed. No improvement followed.

On the following day, the leukocytes having risen to 28,000, and the symptoms becoming worse, a small button of bone was removed from the lower inner portion of the anterior wall of each frontal sinus. Both sinuses were found to be filled with thick pus. There was no bony involvement in the right sinus but bare bone was encountered in the superior portion of the left sinus. A subperiosteal abscess to the right of the midline and 3 cm. above the supra-orbital ridge was evacuated.

Improvement in the external condition of the eye followed this operation, and the patient was more comfortable but as fluctuant areas developed in the right frontal and right frontotemporal regions, it was deemed advisable to make three incisions, one about 6.5 cm. above the right supra-orbital ridge near the midline, another on a line between this incision and the tip of the ear, and the last, about 2.5 cm. above the right ear. An abundance of pus was obtained and the periosteum found to be elevated. The three wounds were connected by subgaleal tunneling and drained by rubber tubes.

Vomiting, headache, slow respiration and pulse rate, along with bilateral choking of the optic disks forced further procedures. Dr. Francis C. Grant removed the anterior wall of both frontal sinuses, finding definite evidence of extensive osteomyelitis. When the posterior wall of the right frontal sinus was removed, pus immediately welled into the wound. When this opening was widened, the dura over the right frontal lobe was found to be covered with granulation tissue and occasional pockets of pus. The diseased bone was removed and then the dura was exposed behind the left frontal sinus without evidence of disease. The wound was packed wide open and convalescence began at once. Optic disk choking disappeared in a week, and the patient was discharged from the hospital two months after admission. No evidence of abscess has developed during the seven months since discharge and the patient is leading an apparently normal existence.

### DISCUSSION

DR. FRANCIS C. GRANT: The question of intradural abscess arose in this case and we decided to explore. It was necessary to incise the abscesses and drain them. After removing the bone, extradural abscesses were exposed. Did the patient have subdural abscesses? We were not sure and feared going through the dura in an infected field and infecting an uninfected brain. Therefore, we went no further. The symptoms of intracranial pressure cleared up and, fortunately, we had to go no further. I am not happy about this patient yet, and will not be until a year has passed. A silent area may still be involved but the patient is gaining weight and appears well.

I have seen four such cases during the past year. Two cases followed frontal sinusitis and both patients died. No choked disk was present but a large abscess of the frontal lobe was found in each instance. Another case, following frontal sinusitis with osteomyelitis, in which there was a frontal abscess, was drained

and packed and the patient recovered. The question of proper treatment for osteomyelitis of the skull is one of radical versus conservative treatment. Emissary veins may cause extension.

In Blair's review of these cases, he reports six of his own, in which the patients were treated conservatively, with no curetting and no dissemination of infection, and he feels that this is the proper treatment. In thirty-seven cases in which radical operation was performed, twenty-five patients died and twelve are living. Of nine patients, conservatively treated, six are living and three died. Death is usually due to brain abscess or meningitis.

Chemotherapy, vaccines and intravenous therapy have their champions. We were conservative in this case, draining only as pus appeared. We never made large incisions and never curetted. The patient probably eventually developed an immunity. This probably limited the infection. I feel that conservative treatment is best: removal of the bone and exposure of the abscess. Do not go through the dura until you have to. Wait ten days and then you can tell if there is a brain abscess or not. Allow the bone to fenestrate.

DR. GEORGE B. WOOD: One of my patients with frontal sinusitis, frontal osteomyelitis and brain abscess, on whom Dr. Grant operated, recovered. The reason why so many of these patients die is because the disease is so close to the brain, which is a vital organ. These patients tend to get well just as much as those with osteomyelitis anywhere else in the body, but meanwhile meningitis or brain abscess may appear. The important point in the cases I have seen has been the securing of drainage of the under surface of the skull. Opening down to the dura accomplishes this and prevents extension through the dura. In the future, I should open a fairly large area of skull to the dura and pack away the dura from the diseased skull until the fibrous walling off process was completed. These cases have a bad habit of flaring up just when you think you have cleared them up. The infection travels extensively through the diploic veins of the skull.

DR. GEORGE M. COATES: The organism in most of these cases is the staphylococcus. What organism was found in this case?

DR. FRANCIS C. GRANT: Many of Adson's cases are due to roentgen burns with superimposed infection. The infection is secondary and his cases do not strictly parallel those about which we are speaking.

DR. STEPHEN D. WEEDER: Herbert Tilley mentions the production of a trough in the bone which efficiently prevents the spread of infection.

# Book Reviews

THE MECHANISM OF THE LARYNX. By V. E. NEGUS, M.S., London. Price, $16.50. St. Louis: C. V. Mosby Company, 1929.

This is a monograph of 258 pages profusely illustrated from drawings for the most part original. Some idea of the comprehensive manner in which the study is carried out can be gained from the headings for the several chapters: Evolution of the Larynx; Modifications for Olfaction; Modifications for Respiration; Modifications for Specialized Mechanisms of Respiration; Function of Movements at the Glottis During Respiration; Modifications for Deglutition; Modifications for Regulation of Intrathoracic Pressure; Mechanism to Prevent Exit of Air from the Lungs; Purposive Use of Sound in Relation to the Sense of Hearing; Employment of Sound as a Means of Communication; Mechanism of Phonation; Physiologic Anatomy of the Human Larynx; Observations on the Evolution of Man from the Evidence of the Larynx.

The volume shows an exhaustive study of the larynx from various angles. The author provides a comprehensive index which enables the student to turn to a discussion of any phase of the subject in which he may be interested.

It is rare indeed that a monograph of this sort is presented to the public. The volume will stand for a long time to come as a last word on the evolution, the structure and the function of the larynx.

# Directory of Otolaryngologic and Ophthalmologic Societies *

## NATIONAL

### American Medical Association, Section on Laryngology, Otology and Rhinology

Chairman: Dr. Robert C. Lynch, Maison Blanche Bldg., New Orleans, La.
Secretary: Dr. Gabriel Tucker, Bronchoscopic Clinic, University Hospital, Philadelphia.
Place: Detroit. Time: June 23-27, 1930.

### American Bronchoscopic Society

President: Dr. Thomas E. Carmody, Metropolitan Bldg., Denver.
Secretary-Treasurer: Dr. Louis H. Clerf, 128 S. 10th St., Philadelphia
Place: Atlantic City, N. J. Time: May 27, 1930.

### American Laryngological Association

President: Dr. Lewis A. Coffin, 114 E. 54th St., New York.
Secretary: Dr. George M. Coates, 1721 Pine St., Philadelphia.
Place: Swampscott, Mass. Time: May 22-24, 1930.

### American Laryngological, Rhinological and Otological Society

President: Dr. Ross Hall Skillern, 1811 Spruce St., Philadelphia.
Secretary: Dr. R. L. Loughran, 33 E. 63d St., New York.
Place: Atlantic City, N. J. Time: May 28-30, 1930.

### American Otological Society

President: Dr. S. MacCuen Smith, 1429 Spruce St., Philadelphia.
Secretary: Dr. Thomas J. Harris, 104 E. 40th St., New York.
Place: Swampscott, Mass. Time: May 20-22, 1930.

### American Academy of Ophthalmology and Oto-Laryngology

President: Dr. William H. Wilder, 122 S. Michigan Ave., Chicago.
President-Elect: Dr. J. F. Barnhill, Miami Beach, Fla.
Executive Secretary: Dr. William P. Wherry, Medical Arts Bldg., Omaha.
Place: Chicago. Time: October, 1930.

## SECTIONAL

### Academy of Medicine of Northern New Jersey, Section on Eye, Ear, Nose and Throat

Chairman: Dr. Frederick J. Wort, 1080 Broad St., Newark.
Secretary: Dr. Earl LeRoy Wood, 31 Lincoln Park, Newark.
Place: 91 Lincoln Park South. Time: 8:45 p. m., second Monday of each month.

### Eastern New York Eye, Ear, Nose and Throat Association

President: Dr. John P. O'Keefe, 251 State St., Albany.
Secretary-Treasurer: Dr. Arthur F. Holding, 142 Washington Ave., Albany.
Time: Third Wednesday of October, November, March, April, May and June.

* Secretaries of societies are requested to furnish the information necessary to make this list complete and to keep it up to date.

NEW ENGLAND OTOLOGICAL AND LARYNGOLOGICAL SOCIETY

President: Dr. Owen Smith, 690 Congress St., Portland, Maine.
Secretary-Treasurer: Dr. Stanwood Fisher, 192 State St., Portland, Maine.

PACIFIC COAST OTO-OPHTHALMOLOGICAL SOCIETY

President: Dr. Arthur C. Jones, 105 N. 8th St., Boise, Idaho.
Secretary-Treasurer: Dr. Walter F. Hoffman, 817 Summit Ave., Seattle.

PUGET SOUND ACADEMY OF OPHTHALMOLOGY AND OTO-LARYNGOLOGY

President: Dr. Will Otto Bell, Medical-Dental Bldg., Seattle.
Secretary-Treasurer: Dr. Francis A. Brugman, Medical-Dental Bldg., Seattle.
Time: 8 p. m., third Tuesday of each month, except July and August.

SOUTHERN MEDICAL ASSOCIATION, SECTION ON EYE, EAR, NOSE AND THROAT

Chairman: Dr. Fred Hasty, 119 Seventh Ave., Nashville, Tenn.
Secretary: Dr. Fletcher D. Woodward, Box 162, University, Va.
Place: Louisville, Ky. Time: November, 1930.

## STATE

COLORADO OTO-LARYNGOLOGICAL SOCIETY

President: Dr. Frank L. Dennis, Ferguson Bldg., Colorado Springs.
Secretary: Dr. Rex L. Murphy, Metropolitan Bldg., Denver.
Place: Assembly Room of Metropolitan Bldg., Time: First Saturday of each month from October to May.

EYE, EAR, NOSE AND THROAT CLUB OF GEORGIA

President: Dr. George B. Smith, Rome.
Secretary-Treasurer: Dr. William O. Martin, Jr., 384 Peachtree St., Atlanta.

INDIANA ACADEMY OF OPHTHALMOLOGY AND OTO-LARYNGOLOGY

President: Dr. H. A. Van Osdol, 320 N. Meridian St., Indianapolis.
Secretary: Dr. Robert J. Masters, 23 E. Ohio St., Indianapolis.
Place: Indianapolis. Time: December 10 and 11, 1930.

MINNESOTA ACADEMY OF OPHTHALMOLOGY AND OTO-LARYNGOLOGY

President: Dr. C. N. Spratt, 900 Nicollet Ave., Minneapolis.
Secretary-Treasurer: Dr. J. H. Morse, 80 S. 7th St., Minneapolis.

MONTANA ACADEMY OF OTO-OPHTHALMOLOGY

President: Dr. Lee W. Smith, 125 W. Granite St., Butte.
Secretary: Dr. J. G. Parsons, Lewistown.
Time: Semi-annually.

NORTH DAKOTA ACADEMY OF OPHTHALMOLOGY AND OTOLARYNGOLOGY

President: Dr. George M. Constans, Bismarck.
Secretary-Treasurer: Dr. F. L. Wicks, Valley City.

OREGON ACADEMY OF OPHTHALMOLOGY AND OTOLARYNGOLOGY

President: Dr. J. W. McCollom, 346½ Washington St., Portland, Ore.
Secretary: Dr. Andrew J. Browning, 418 Mayer Bldg., Portland,Ore.
Place: Good Samaritan Hospital. Time: Third Tuesday of each month.

### Rhode Island Ophthalmological and Otological Society

President: Dr. J. E. Raia, 272 Broadway, Providence.
Secretary: Dr. F. W. Dimmitt, Jr., 195 Thayer St., Providence.
Place: Rhode Island Medical Library. Time: 8:30 p. m., second Thursday in October, December, February and April.

### Utah Ophthalmological Society

President: Dr. F. M. McHugh, 17 Exchange Pl., Salt Lake City.
Secretary-Treasurer: Dr. W. Leroy Smith, Ezra Thompson Bldg., Salt Lake City.

### Virginia Society of Otolaryngology and Ophthalmology

President: Dr. H. B. Stone, 303 First St., Roanoke.
Secretary-Treasurer: Dr. Fletcher D. Woodward, Box 162, University.

## LOCAL

### Atlanta Academy of Ophthalmology and Otolaryngology

President: Dr. Leon E. Brawner, 157 Forrest Ave., Atlanta.
Secretary: Dr. William O. Martin, Jr., 384 Peachtree St., Atlanta.
Place: Academy of Medicine, 38 Prescott St. N. E. Time: 8 p. m., last Thursday of each month.

### Baltimore City Medical Society, Section on Otology and Laryngology

Chairman: Dr. Waitman F. Zinn, Medical Arts Bldg., Baltimore.
Secretary: Dr. Moses L. Breitstein, 1212 Eutaw Pl., Baltimore.
Place: 1211 Cathedral St. Time: 8:30 p. m., last Friday of each month.

### Chicago Laryngological and Otological Society

President: Dr. Samuel Salinger, 25 E. Washington St., Chicago.
Secretary-Treasurer: Dr. Austin A. Hayden, 25 E. Washington St., Chicago.
Place: Medical and Dental Arts Bldg., 185 N. Wabash Ave. Time: 6 p. m., first Monday of each month from October to May.

### Cincinnati Oto-Laryngological Society

President: Dr. Harris H. Vail, 24 E. 8th St., Cincinnati.
President-Elect: Dr. Edward King, Pearl Market Bank Bldg., Cincinnati.
Secretary-Treasurer: Dr. Donald Lyle, 19 W. 7th St., Cincinnati.
Place: University Club. Time: 6:45 p. m., second Tuesday of each month from October to May.

### Cleveland Academy of Medicine, Section of Ophthalmology and Otolaryngology

Chairman: Dr. M. Paul Motto, Rose Bldg., Cleveland.
Secretary: Dr. A. D. Ruedemans, Euclid and E. 93d St., Cleveland.
Place: Winton Hotel. Time: Fourth Friday of each month.

### College of Physicians of Philadelphia, Section on Otolaryngology

Chairman: Dr. George M. Coates, 1721 Pine St., Philadelphia.
Clerk: Dr. Frederic M. Strouse, 1301 Spruce St., Philadelphia.
Place: College of Physicians. Time: 8:30 p. m., third Wednesday of each month from October to June.

### Dallas Academy of Ophthalmology and Otolaryngology

President: Dr. D. L. Bettison, Medical Arts Bldg., Dallas, Texas.
Executive Secretary: Dr. W. Mood Knowles, Medical Arts Bldg., Dallas, Texas.
Recording Secretary: Dr. L. A. Nelson, 4105 Live Oak, Dallas, Texas.
Place: Dallas Athletic Club. Time: 6 p. m., first Tuesday of each month from October to June. The November, January and March meetings are devoted to clinical work.

### Detroit Oto-Laryngological Society

President: Dr. C. C. McClelland, David Whitney Bldg., Detroit.
Secretary-Treasurer: Dr. Don A. Cohoe, 13535 Woodward Ave., Detroit.
Place: Maccabees Bldg. Time: Third Wednesday evening of each month from October to May.

### Fort Worth Eye, Ear, Nose and Throat Society

President: Dr. W. R. Thompson, 510 Main St., Fort Worth, Texas.
Secretary-Treasurer: Dr. R. H. Needham, Fort Worth National Bank Bldg., Fort Worth, Texas.
Place: University Club. Time: 6:30 p. m., first Friday of each month except July and August.

### Houston Academy of Medicine, Eye, Ear, Nose and Throat Section

President: Dr. Claude C. Cody, 1306 Walker Ave., Houston, Texas.
Secretary: Dr. J. M. Robison, Eye, Ear, Nose and Throat Hospital, Houston, Texas.
Place: Medical Arts Bldg., Harris County Medical Society Rooms. Time: 8 p. m., first Thursday of each month from September to June.

### Indianapolis Ophthalmological and Oto-Laryngological Society

President: Dr. Robert J. Masters, Hume-Mansur Bldg., Indianapolis.
Secretary: Dr. Kenneth L. Craft, Hume-Mansur Bldg., Indianapolis.
Place: University Club. Time: 6:30 p. m., second Thursday of each month from October to May.

### Kansas City Society of Ophthalmology and Otolaryngology

President: Dr. L. R. Forgrave, Logan Bldg., St. Joseph, Mo.
Secretary: Dr. A. E. Eubank, Argyle Bldg., Kansas City, Mo.
Time: Third Thursday of each month from September to May. The November, January and March meetings are devoted to clinical work.

### Long Beach Eye, Ear, Nose and Throat Society

President: Dr. W. B. Wright, Jr., 1209 Pine Ave., Long Beach, Calif.
Secretary-Treasurer: Dr. M. A. Schurter, 114 E. 7th St., Long Beach, Calif.
Place: Pacific Coast Club. Time: Last Wednesday of each month from September to June.

### Los Angeles County Medical Society, Section of Ophthalmology and Otolaryngology

President: Dr. A. Ray Irvine, 727 W. 7th St., Los Angeles.
Secretary-Treasurer: Dr. J. Frank Friesen, 727 W. 7th St., Los Angeles.
Place: California Hospital, assembly room. Time: 8 p. m., first Monday of each month.

### Medical Society of the District of Columbia, Section on Ophthalmology and Oto-Laryngology

Chairman: Dr. Louis S. Greene, 1710 Rhode Island Ave. N. W., Washington.
Secretary: Dr. E. R. Gookin, Medical Science Bldg., Washington.
Place: 1718 M St. N. W. Time: 8 p. m., third Friday of each month.

### Memphis Society of Ophthalmology and Oto-Laryngology

Chairman: Each member, in alphabetical order.
Secretary: Dr. R. O. Rychener, Exchange Bldg., Memphis, Tenn.
Place: Eye Clinic of Memphis Eye, Ear, Nose and Throat Hospital. Time: 8 p. m., second Tuesday of each month.

### The Milwaukee Oto-Ophthalmic Society

President: Edward R. Ryan, 425 E. Water St., Milwaukee.
Secretary-Treasurer: Dr. O. P. Schoofs, 120 E. Wisconsin Ave., Milwaukee.
Place: University Club. Time: 6:30 p. m., third Tuesday of each month.

### Nashville Academy of Ophthalmology and Otolaryngology

Chairman: Dr. R. J. Warner, 706 Church St., Nashville.
Secretary-Treasurer: Dr. W. W. Wilkerson, Jr., Bennie-Dillon Bldg., Nashville, Tenn.
Place: St. Thomas Hospital. Time: 8 p. m., third Monday of each month.

### New Orleans Ophthalmological and Otological Society

President: Dr. William A. Wagner, Pere Marquette Bldg., New Orleans.
Secretary-Treasurer: Dr. M. F. Meyer, Canal Bank Bldg., New Orleans.
Place: Eye, Ear, Nose and Throat Hospital. Time: January to June and October to January—third Thursday of each month.

### New York Academy of Medicine, Section of Laryngology and Rhinology

Chairman: Dr. Mervin C. Myerson, 12 E. 86th St., New York.
Secretary: Dr. John M. Loré, 240 West End Ave., New York.
Place: 103d St. and 5th Ave. Time: 8:30 p. m., fourth Wednesday of each month from October to May.

### New York Academy of Medicine, Section of Otology

Chairman: Dr. Clarence H. Smith, 2 E. 54th St., New York.
Secretary: Dr. James Garfield Dwyer, 57 W. 57th St., New York.
Place: 103d St. and 5th Ave. Time: Second Friday of each month from October to May.

### Omaha and Council Bluffs Ophthalmological and Otolaryngological Society

President: Dr. Charles M. Swab, Medical Arts Bldg., Omaha.
Secretary-Treasurer: Dr. J. C. Davis, 1615 Howard St., Omaha.
Place: Medical Arts Tea Room. Time: 5:15 and 7 p. m., third Wednesday of each month from October to May.

### Philadelphia Laryngological Society

President: Dr. Henry A. Laessle, 13th and Spruce Sts., Philadelphia.
Secretary: Dr. Herman B. Cohen, 13th and Spruce Sts., Philadelphia.
Place: College of Physicians. Time: 8:30 p. m., first Tuesday of each month from October to June.

### Pittsburgh Otological Society

Chairman: Dr. John R. Simpson, 115 South Highland Ave., Pittsburgh.
Secretary-Treasurer: Dr. Watson Marshall, 121 University Place, Pittsburgh.

### Rochester Eye, Ear, Nose and Throat Society

Chairman: Dr. A. Vincent Walker, 833 South Ave., Rochester, N. Y.
Secretary-Treasurer: Dr. John F. Gipner, 53 Fitzhugh St., Rochester, N. Y.
Place: Rochester Medical Association, 13 Prince St. Time: 8 p. m., third Monday of each month from October to May.

### St. Louis Ear, Nose and Throat Club

Acting President: Senior member of the executive committee: Dr. F. C. Simon, Arcade Bldg., St. Louis, Mo.
Secretary: Dr. M. L. Hanson, Murphy Bldg., East St. Louis, Ill.
Place: University Club Bldg. Time: Third Wednesday in February, April, October and December.

### San Antonio Ophthalmolo-Oto-Laryngological Society

President: Dr. F. W. Sorrell, Gibbs Bldg., San Antonio, Texas.
Secretary-Treasurer: Dr. A. F. Clark, 728 Main Street, San Antonio, Texas.
Place: Bexar County Medical Library. Time: 8 p. m., first Tuesday of each month from October to May.

### Spokane Academy of Ophthalmology and Otolaryngology

President: Dr. A. N. Codd, 421 W. Riverside Ave., Spokane, Wash.
Secretary: Dr. Marc Anthony, Old National Bank Bldg., Spokane, Wash.

### Syracuse Eye, Ear, Nose and Throat Society

President: Dr. George H. Rockwell, Physicians Bldg., Syracuse, N. Y.
Secretary-Treasurer: Dr. A. Harry Rubenstein, Medical Arts Bldg., Syracuse, N. Y.
Place: University Club. Time: Second Friday of each month except June, July and August.

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